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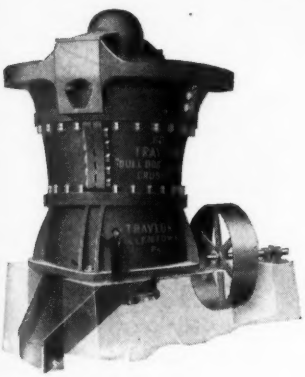

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April, 1923

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A Monthly Journal for Producers of Sand, Gravel, Stone, Cement, Gypsum and Lim

Vol. 7 CHICAGO, ILL., APRIL, 1923 No. 7

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Pit and Quarry

Vol. 7 Chicago, Ill., April, 1923 No. 7

Visiting Operations

THE editors of this journal, in their travels, have found a very large number of pit and quarry operators are following the practice, during the dull season, or at other times of the year, when it is convenient for them to leave their own business, to visit operations similar to their own, to study and learn of improved methods and of the most modern machinery adapted to their work. This is a practice that is to be commended, and every operator should spend some time and money in doing this.

There are many advantages to be gained by pursuing this course. One of the bad features of American business is the hard grind that most men have, to keep their business to the top notch. This continual application is the price of success; yet on the other hand it causes a man to become stale, just as an athlete does from overtraining, with the result that he is not able to do his best at all times. Thus the business man who stays on the job, from one year's end to the other, is not as keen in his work as he should be, makes errors of judgment, and loses that broad perspective that he should have, with the result that he does not make all the profits that he should.

This is especially so in producing pit and quarry products. One authority on this subject states that these products are classed as low grade commodities; that is, the margin of product is unusually small, and as dividend producers they cannot be attractive unless every cent is saved in their production, and the output per day is fairly large. With these statements being considered as true, it is evident that pit and quarry operators should always be at their best, and that they should handle their proposition so that not a cent is wasted, and their production for any stated period should be as large as possible, really exceeding their sales, so as to make it necessary to augment them.

A few short trips made during the year, or one longer trip, will go a long way towards resting up a business man. It will sharpen his wits, improve his business ideas by meeting other successful business men, and broaden his vision, besides giving him a much needed vacation, and some recreation. Besides these things, an operator who is visiting plants in other sections of the country will learn many things that he could not learn at home, or through books and journals.

PIT AND QUARRY would recommend to every operator that during the coming year, he take some time to visit plants that are producing products similar to his own. It is needless to comment further on the advantages to be gained by this procedure, but it may be well to give a word of warning as to jumping to conclusions and making erroneous deductions from things that are seen on such trips.

It is advisable to see plants in actual operation, rather than when they are idle. By doing so, operations can be watched and a good method picked from the bad, while the merits of machines as well as their demerits can be seen.

Setting the Pace for the Job

IN EVERY pit and quarry operation, it is necessary to have a pace maker for the job if real economy is to be practiced. An operation without a pace maker means slow work and an irregular output.

In many cases there are pace makers, yet little attention is paid to them, which is a great mistake.

What should be the pace maker? This must depend upon the kind of a layout at each plant, and a hard and fast rule cannot be laid down.

If a stone crushing quarry is operated by using a cableway for transporting the stone from the breast of the ledge to the crusher, then the stone crushed must depend upon the service rendered by the cableway. This must be made the pace maker of this operation, and every endeavor must be made to keep the cableway working to its greatest capacity.

The same thing is true about a gravel or sand washing plant that is fed by a belt conveyor or a slack line cableway. These must be made the pace makers.

On the other hand if plants are fed by trucks or cars, then the pace makers should be the crusher or washers. If the crusher has a greater capacity than the amount of rock that can be delivered by two trains, then additional trains should be used; or if one steam shovel is not able to furnish stone to keep the crusher going, another shovel should be installed. In other words if the crusher has a capacity of a thousand tons per day every effort should be put forth to make it produce that tonnage instead of being satisfied with half that amount, especially if the full capacity can be sold. It can be seen that the crusher should set the pace and all the work at the ledge and the transportation facilities should be co-ordinated to the work of the crusher.

The same thing is true of a screening or washing plant for sand and gravel. If these things are not done then there is little use of having such a large size crusher unless it is used alone for breaking up boulders, that is of saving money in breaking large boulders. Even this though would make boulder breaking expensive.

A pace maker means to increase the output of the product, and cut down not only the operating costs in most cases, but also the overhead charges on each unit of material produced. This will add to the profit made on each unit of the output and by this and the increased sales nothing is more money made but the profits will accumulate quicker.

Value of a Minute

A READER calls attention to the article under the above caption in the September issue of PIT AND QUARRY, commending the article, yet stating that it is incomplete without some comment upon the time lost by breakdowns of machinery and the value of a minute in preventing such breakdowns and making the necessary repairs.

This suggestion coming from a reader is of value. However, the writer of the previous article thought that all concerned would understand these things, but a few comments may be of value.

In looking over the advertisements in this journal it is quite surprising the number of "ads" that bear directly upon this subject. One caption reads, "Fewer Trouble Hours per Year." Another says, "Blank Performance Scores Again." A third caption is, "The Value of Time." Another ad states, "The durability and performance of your equipment determines the speed of production and the amount of your profits."

This presents the matter in a nutshell. No matter how rapidly a ma

chine can be operated, if it is poorly built so there are frequent breakdowns the output of the machine is materially reduced, and no matter how many time studies have been made in order to save minutes or fractions of minutes, such studies are in vain. This is true no matter what kind of a machine is being used. A truck may be able to travel 120 miles in a 10 hour day, but if it is being repaired for half the day and makes but 60 miles, the service is not equal to a truck making but 9 miles an hour, yet keeps going throughout the week without being repaired.

Thus to realize the value of minutes and obtain the proper returns from each minute when machinery is being operated, the first consideration must be dependable machines. Then the saving of minutes and seconds can engage the attention of the operator in working the machinery as outlined in the previous article.

One advertiser aptly expresses the entire subject in saying:

"PERFORMANCE—long continued service under the most severe conditions have proven our machines to be dependable."

This is the test of time, and means service; this is the value of a minute in machine operation, followed by service and time studies in actual operation. But all machines must be co-ordinated. A steam shovel in a quarry may be dependable, but if the cars serving it are continually out of order, the shovel will be idle most of the time. The cars must be as dependable as the shovel.

The plant of the Wilkinson Sand Corp., located near Wedron, Illinois, are spending $25,000 on new machinery and equipment, including a steam shovel and steam locomotive. The shovel will have a capacity of 35 cars of sand a day. Mr. C. W. Wilkinson, who is president and treasurer of the company, has offices in the Moloney Bldg., Wedron, Ill.

Time Clocks

IN ANY operation as a quarry or sand and gravel pit, when the work is scattered over a large area of ground, it is difficult to know when men report for work and also if they leave before the proper time. Without a check on this, men soon learn that they can report for work late without being found out and they can likewise slip away half an hour or more before the noon hour or in the evening.

There is but one method of overcoming these conditions and that is by use of a time clock. A timekeeper can by careful watching prevent many omissions, errors and stealing of time, but it is not possible for a timekeeper to be on hand for every minute in the day, but a timekeeper and a time clock can be on hand to protect the employer against paying for time and work he does not receive.

With a time clock a card is made out for each employe for every day and on this the clock punches or marks the time of coming to work and leaving, and this can be done not only morning and evening but if necessary can punch the time card in and out at noon.

By the use of these cards the minute of coming and going is recorded, and with such a record and the help of a timekeeper to see the men while at work, it is hardly possible for men to steal much time.

From the time cards the payroll is made up. The time clock also furnishes an official timepiece for the job, and prevents men from using their own timepieces, which may be wrong. Likewise it is not possible for foremen to stand in with men and rob the employer of time or pad the payroll with men who are not working.

There are so many advantages of time clocks over the ordinary methods of keeping time, that the clocks soon pay for themselves.

Rock Loading at Lime-Plant Quarries

By OLIVER BOWLES.
Mineral Technologist, U. S. Bureau of Mines

REMOVING fragments of broken rock from the quarry floor and placing them in cars for transportation to the kilns is a very important quarry process. At most lime plants rock-loading constitutes the largest single item of quarry cost. In view of the great expense involved in loading, a consideration of the relative merits of different methods followed, and the conditions under which each method may be most advantageously employed are worthy of more than ordinary attention.

Hand loading of rock fragments is conducted at practically all small lime plants and at many large ones. While the wide application of the method may be due partly to reluctance of operators to depart from methods long in use, its employment by many progressive companies suggests inherent advantages that merit careful scrutiny.

An undoubted advantage to small operators with limited capital is the small outlay required for loading equipment. This consists of trackage, cars and ordinary hand tools such as pick, shovel, sledge and fork.

A second advantage is the opportunity it affords for selection of suitable material. Personal observation of every fragment permits the rejection of siliceous or otherwise impure masses. The hand loader is enabled also to reject all small-sized stone together with any clay or sand that may have been blasted down with the rock. Such undesirable materials are loaded on separate cars and removed either to a screening plant for recovery of the best stone, or to the waste heap.

A third advantage which is of exceptional importance in the lime industry is the ability of the hand loader to maintain a minimum of fine materials. In modern lime burning in shaft kilns very little rock smaller than 4-inch is acceptable, for it retards the draft. While all exceptionally large rock masses encountered in loading are blasted in block holes, masses of medium size are sledged to fragments not exceeding 10 to 12 inches across. The skilful sledger will break the rock into the desired sizes and produce only a very small amount of fine material The mechanical breaker such as the jaw or gyratory crusher will subject the rock to much rougher treatment and thus produce more fines.

A fourth advantage in hand loading is the small delay to following operations that results from failure of loading equipment. Where loading is accomplished by one large machine, breakage of some essential part will cut off production entirely, while a steady flow of rock from a number of independent units insures more continuous operation.

The tonnage of rock handled per man employed is much lower when hand loading is followed than where mechanical equipment such as the steam shovel is employed. Therefore, a large gang of hand loaders is required to obtain the necessary output for a large lime plant. This is a decided disadvantage at times when labor is scarce or when wages are high.

In loading waste materials the advantage is more definitely on the side of the steam shovel. Where hand methods are employed the loading of dirt and rock chips is slower than the loading of kiln stone. Commonly the contract price of loading dirt is 2 or 3 cents per ton higher than the price paid for loading good stone. The

Mr. Bowles Would Like Answers to These Questions from Operators

1. **Do you prefer hand loading in your quarry and why?**
2. **Do you prefer steam shovel loading in your quarry and why?**
3. **What are your hand loading costs per ton?**
4. **What are your steam shovel loading costs per ton?**
5. **What items are included in steam shovel costs?**
6. **What information on loading could you supply in addition to that presented in this paper?**

Address Mr. Oliver Bowles, care of PIT AND QUARRY, or direct to Bureau of Mines, Washington, D. C.

steam shovel, on the other hand, loads dirt with greater facility than it loads stone.

Steam shovels are very widely used for rock loading at quarries, but in the production of stone for lime burning this type of loading equipment is used less extensively than in most other branches of the stone industry. The main reason for this condition is the necessity for sorting of stone according to both size and quality. As the steam shovel lacks the ability to thus select its materials, crushing and screening equipment must be added, and this involves so heavy a first cost that many operators prefer to use hand methods.

The extent of the operation should govern the size of the shovel. For an output of 150 to 300 tons of rock per day small tractor shovels with ¾ to 1¼ yard dippers are suitable. Caterpillar tractors offer special facilities for rapid moving, or for working on a soft bottom. For larger operations heavier shovels should be used. It is not economical to use either too small or too large a machine. Where the shovel is small in proportion to the size of following equipment many blocks too large for the shovel to handle must be blasted even though sufficiently small to be readily crushed. This results in unnecessary blasting expense and waste of time. On the other hand, if a large shovel is used for a limited output the operating cost is excessive.

Where hand loading is followed all rock masses must be broken at least to "one-man" size. The steam shovel, however, can handle rocks of several hundred pounds or even in excess of a ton in weight. If the primary blast breaks up the rock moderately well very little secondary blasting may be required, whereas in hand loading much secondary blasting, as well as a great deal of laborious hand sledging are necessary.

For equal tonnage produced a much smaller gang of men is required with a steam shovel than for hand loading. Figures were compiled by the Bureau of Mines a few years ago for tonnage of rock per man loaded at cement-plant quarries. At 14 quarries where steam shovels were used an average daily output of 112 tons per man was obtained. In this estimate pit men and shovel men only were taken into account. For 11 quarries where hand loading was employed the daily tonnage per man, loaders only, was 16. This indicates that about 7 times as much rock per man can be loaded with steam shovels as can be done by hand. The possibility of greatly reducing the number of workers by substituting machines has an important bearing on many problems that confront the operator. In some instances the maintenance of a large output with a great-

ly reduced staff has for various reasons quite distinct from the actual cost, constituted the deciding factor in the introduction of mechanical loading.

The ability of the steam shovel to load rock of all sizes from chips to masses over a ton in weight is a great advantage in so far as the actual loading process is considered, but it necessitates additional work at later stages. For lime burning the rock must be in sizes approximately between 4 and 10 inches, and thus it is necessary to have crushing and screening equipment when steam shovel loading is followed. Any operator therefore who plans to add a steam shovel to his quarry equipment, and who has no crushing plant, must face the additional expense for machinery to break and size the rock.

A further limitation of the mechanical loader is its inability to sort material according to quality. If flint, iron stain, or other undesirable impurities are scattered irregularly throughout the rock mass, the steam shovel loads them with the good rock. Lime manufactured from stone from which such impurities are not separated is of lower quality than that manufactured from hand picked stone. A steam shovel operating in rock of fluctuating quality tends, therefore, to degrade the final product.

A steam shovel together with the necessary crushing and screening equipment requires a heavy investment which may not be justified for a small plant, though it may be a profitable investment for a larger operation. For small to moderate-sized plants with limited capital it may be more economical to follow hand loading methods.

In any attempt to compare the cost of steam shovel and hand loading, consideration must not be confined to the mere loading processes. The secondary blasting cost is higher for hand loading than for shovel work. On the other hand a steam shovel loads a mixed product from masses weighing tons to fine chips and dirt, while hand loaded rock is broken to size and separated from the fines. A hand sledge is a poor substitute for a rock crusher, and sizing of rock by hand picking is less efficient than mechanical screening, nevertheless, they serve the purpose in a degree, and part at least of a crushing and screening cost must be added to the steam shovel loading cost in order to make a fair comparison between the methods.

The cost of hand loading is easy to determine for it is done almost entirely by contract. The contract price in eastern United States during 1922, varied from 18 to 23 cents per ton. To this must be added the expense for tools such as picks, shovels and forks. The cost of steam shovel loading involves other and more complex factors. To the wages of shovel operators and pitmen must be added the necessary expense for fuel, oil, repairs, interest on investment and amortization (a proportion of the value set aside each year sufficient to replace the shovel with a new one when it becomes no longer serviceable). As noted above in comparing the cost with that of hand loading, part of the crushing and screening expense should be added to the cost of steam-shovel loading and a deduction made to compensate for the reduced blasting expense where the shovel is used. When the direct cost of steam shovel loading is considered it may appear to be very much lower than the cost of hand loading, but when all factors are taken into account the difference is not so great. However, for open-pit work on a large scale it is probable that mechanical loading is considerably cheaper than hand loading.

A more definite report on costs

could be prepared if operators would submit to the Bureau itemized cost data of steam shovel loading.

Small blasts on shallow benches are unsatisfactory for steam shovel loading, for a succession of small supplies of rock involve great loss of time in moving the shovel and placing tracks. Heavy blasts that throw down large volumes of stone are better suited for economical steam shovel operation. Furthermore the blast should not throw the rock down in a thin sheet, for this again not only necessitates frequent moves, but the shovel dipper is filled with difficulty when it works against a small resistance.

Adjustment of the charge to break the rock properly is of course a prime necessity. Insufficient shattering results in great loss of time in shifting masses of rock to one side for secondary blasting.

As the steam shovel lacks the ability to sort materials, a clean product can not be produced if the overburden is only partly removed. The loading of mixed rock and soil is justified only where equipment for subsequent separation is provided. Screens may give a clean separation in dry weather, but a mixture of clay and rock is more difficult to handle in rainy seasons. If, through the presence of seams or clay-filled pockets, it is impossible to remove the overburden entirely, a washing equipment may assist greatly in promoting successful operations of the steam shovel.

The great advantage of the steam shovel is its ability to load many tons of rock per hour, but this advantage is largely nullified in many quarries through delays in waiting for cars. Tracks should be so arranged that empties may be placed, and loaded cars removed with the smallest possible loss of time. There should also be an adequate supply of cars, so that small delays at the crusher will not suspend loading through shortage of empties.

The efficiency of a steam shovel depends largely on the skill of the shovel runner. An experienced operator can load rock rapidly, and can use the dipper to move cars or to set aside large masses of rock for subsequent blasting. Care and good judgment are necessary qualifications. The ability to judge properly the size and dimensions of blocks are invaluable qualifications of a shovel runner, for the loading of over-sized fragments may greatly hamper operations through delay at the crusher. So prevalent are delays from this cause that a fixed rule is maintained at some quarries requiring all rock loaded to pass through the dipper.

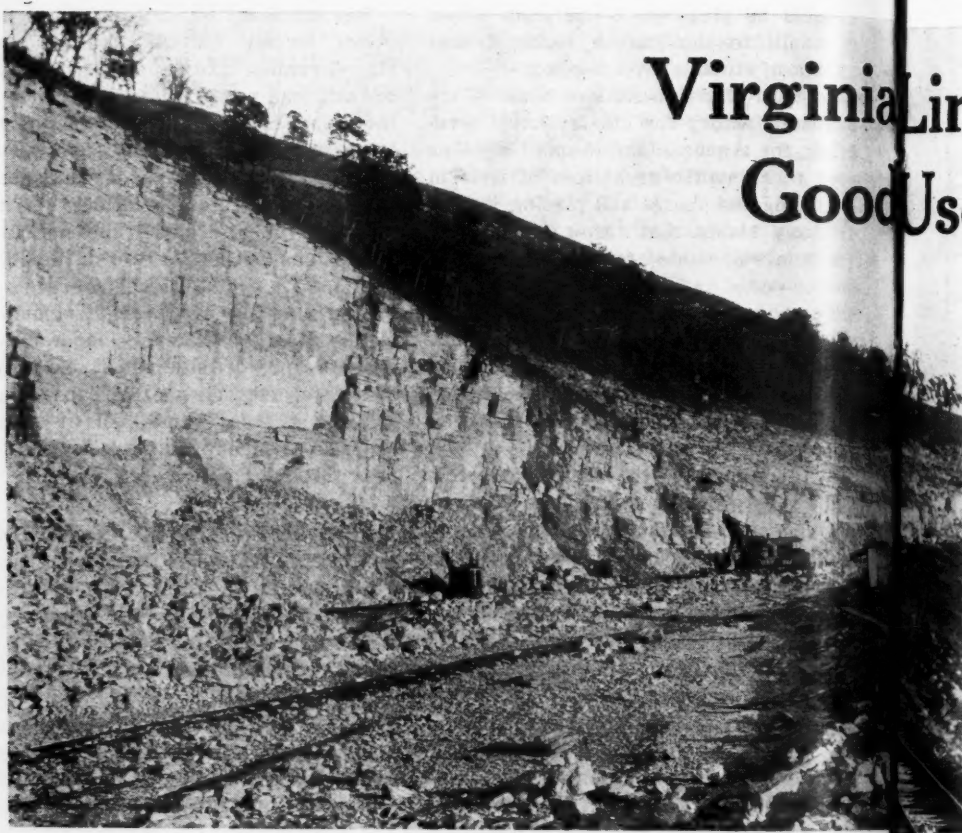
Labor and Wage Conditions

OPERATORS are facing a situation in which there is some scarcity of labor already apparent and in which they may expect to write up a higher figure of cost for productive labor. Wages are higher. The increase varies in different sections of the country, but practically everywhere there are reports of wage advances and of still further demands.

It is a situation making for thoughtful attention to the matter of power-driven labor saving equipment and devices, especially for handling material. There are two good reasons for investing in new equipment of this kind at the present time. One is the scarcity of help, and the other is the higher cost. Back of these, too, is the natural and logical progress in invention and development of mechanical devices to do the work of man.

So, whatever may happen in the future in the way of changes, the situation at present is one favorable to the investment in labor saving devices so as to carry on and serve the needs of the trade and at the same time hold down the cost of operations to a minimum and be so far as practicable independent of labor supply and wage demands.

Virginia Li
Good Us

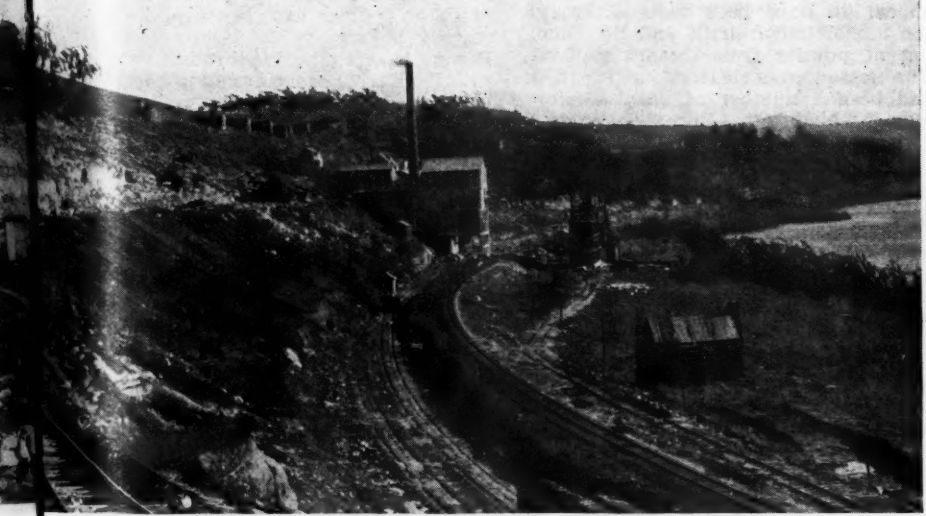


A company that has for years controlled many stone crushing plants would be expected, on the acquisition of a new plant, to know enough about stone crushing to make of the latest addition to the group a pretty efficient operation. Sometimes, perhaps, it doesn't work out quite this way, but in the case of the Virginian Limestone Corporation it did. This organization, which controls some 15 plants, made of their newest operation at Klotz, Virginia, one that is ahead of all their others in efficiency and economy of operation. The new plant reflects all the experience accumulated during the years in which the guiding spirits of the company have been engaged in the business of producing crushed stone.

They have a real plant at Klotz, a little way station near Ripplemead, some 60 miles southwest of Roanoke. And they are making that plant better right along, the betterments coming in the nature of additions to the screening, washing, crushing and shipping facilities. At the time of the writer's visit, for example, a whole new washing plant was under construction and preparations were being made to build an aerial cableway across the New river to a loading plant on the other side, which will give the company shipping facilities on the Norfolk and Western Railroad, as well as on the Virginian Railroad.

The men who are doing this work are well known to stone producers in another section of the country. Mr. Charles A. Klotz, president of the Virginian Limestone Corporation, has been prominently identified for many years wtih the crushed stone industry of the middle west, and has operated quite a number of plants in and around Chicago, as has also Mr. G. W. Lenzie, vice-president of the Virginian Cor-

Limestone Plant Makes Use of Fine Stone



poration. Mr. J. Allen McGraw, general manager, and Mr. W. B. Bobbitt, superintendent, have also spent considerable time in the Chicago district. Mr. Bobbitt was at one time superintendent of the Ives quarry at Racine, Wisconsin, described in a recent number of PIT AND QUARRY.

The holdings of the company at the Virginian location include 700 acres of dolomitic limestone, a complete crushing and screening plant, a washing plant, power plant, loading station fed by an aerial cableway, machine shops, and quarters for the people employed at the plant. Quarry development has been going on now for about five years, and an adequate working face has been exposed, although the possibilities of the quarry location cannot be realized until the face has been worked further back to permit of slightly different blasting methods.

The stone has characteristics that make it a desirable material for concrete work, for ballasting, for fluxing and for the manufacture of agricultural stone. The Government physical test, made by A. G. Goldbeck, engineer of tests, showed that the material has a

Per cent of wear	3.00
Hardness	15.30
Toughness	11.00
Weight per cubic foot	175.00
Per cent of absorption	0.24

The chemical analysis made by Froehling & Robertson of Richmond, Virginia, showed:

Moisture	0.31 per cent
Silica	8.00 " "
Iron and Alumina	2.88 " "
Calcium Carbonate	51.81 " "
Magnesium Carbonate	36.49 " "
	99.49 per cent

As encountered in the quarry, the stone is seamy and for this reason, not the easiest of materials to drill

and blast efficiently. Before the company adopted its present blasting methods it experimented with a variety of plans and found that the undoubted merits of all these methods did not apply in this particular case—for example, the well known economies that usually come with the use of well drills and sprung holes, were not realized when these practices were employed at Klotz. Loading with dynamite is done more lightly than in most places and the location of drill holes is calculated rather more carefully. The most satisfactory results appear to have been gained through the use of tripod drills and the shooting of powder from unsprung holes. The lesson was learned after there had been a number of unsatisfactory blasts which left after them ragged quarry faces.

The first work of the quarry, that of stripping, is accomplished hydraulically. Water is pumped from the New river by a heavy duty Worthington duplex, compound, reciprocating pump, to a tank at a high point on the property. From this tank it is taken up by an Advance pump which gives a nozzle pressure of 150 pounds and insures the removal of all dirt and clay. The Virginian company has an ideal location for a stripping operation. There is plenty of water and, although it has to be elevated and piped quite a distance, this water is procured at a comparatively small cost. There is also an easy means of disposing of the spoil in the river itself. The stone is scoured off clean. All dirt and clay is removed from the quarry surface and taken out from spaces between the vertical joints where, in a number of cases, it is present in large quantities. The careful stripping methods insure the quarrying of clean stone which will not impose too great a burden on the washing facilities of the plant.

As already stated, drilling is done with tripod air drills. Ingersoll-Rand DDR13 drills are employed. The stone is shot down to the floor from which it is loaded by a Class 80 Atlantic type steam shovel, weighing 120 tons and equipped with a 3½ yard bucket.

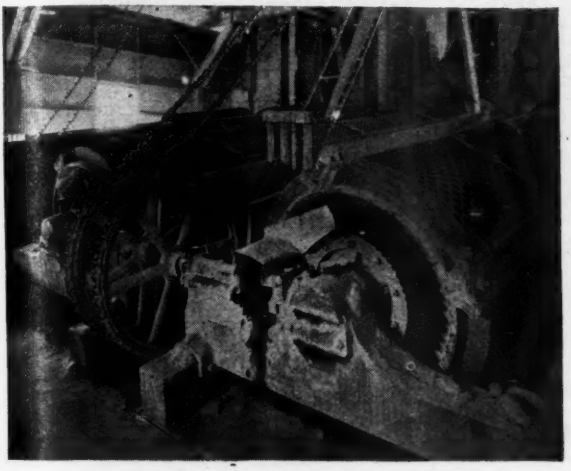
A description of a clever kink that saves the company a great deal on its drill sharpening and considerably expedites this work will be found on another page of this issue of PIT AND QUARRY. Producers with old shovels that will serve no useful purpose may learn something from it.

The next operation, that of conveying the stone from the shovel to the plant is handled in a way rather different from any of the standard methods. A Woodford automatic electric haulage system is installed at this plant and takes care of the work of carrying stone between the shovel and the crusher. Electrically operated cars of 15 tons capacity each, controlled from a central tower at the plant, are run up to the shovel and back to the crusher at the will of the operator. Cars can be stopped and started at any point in the quarry. Power is distributed through "third rails." Each car is a motor car and is operated independently of locomotives. The operator's station is located at a point where he can at all times command a full view of the entire quarry. The cars dump at a point below and directly in front of the control tower.

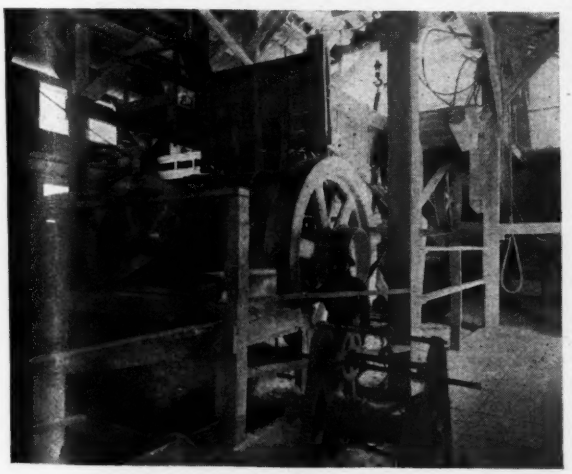
The dumping is also by automatic action. As the cars go up to the crusher, they engage with the mechanism shown in a number of the illustrations. This automatic dumper, a part of the Woodford system, is also under the control of the operator.

Cars dump at the side into a hopper at the bottom of which is a Stephens-Adamson apron feeder, 60 inches wide and 16½ feet between centers. This feeder is of cast steel and has bosses which engage the pieces of stone as the feeder moves forward. The device serves the purpose of balancing plant and quarry operations. It feeds just enough stone to keep the primary breaker busy, taking its supply from the hopper which can contain large or small lots of stone. Thus, quarry operations can fluctuate considerably without either choking the crusher or allowing it to run out of stone. This apron feeder is just the same width as the crusher, thus making certain that stones of the right size will be passed ahead. An Ingersoll-Rand air hoist is also installed at this point. It runs on rails above the crusher and can be made to serve a variety of purposes.

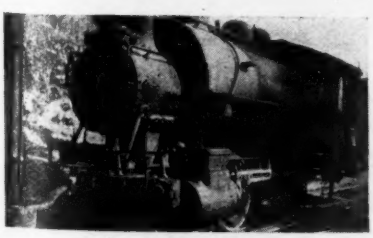
The primary breaking machine is a 48x60 inch Power & Mining jaw crusher. This piece of equipment reduces stone from 8 to 10 inch. Through this 4x5 foot opening, fed by the apron feeder described above, go the largest stones taken up by the



48 Inch by 24 Foot Revolving Screens Located in the Upper Screen House



Note the Roomy Space Around the Primary Jaw Crusher



American Locomotive Used for Switching Cars

shovel. As shown in one of the illustrations this crusher is installed in a way that allows plenty of room all round it in which to make repairs and adjustments. In fact, it is a feature of this plant that plenty of room is given in all parts to permit of easy repairs. It is very emphatically not a sardine can plant, yet is sufficiently compact so that material is not conveyed over too great distances.

From the jaw crusher the stone, which runs from 8 to 10 inches, drops to a stationary screen with 3½ inch openings, the whole screen set at an angle of 45 degrees. This device serves as a grizzly and makes a separation of material at a little over 3 inches. From this point on, the product passing the grizzly and that which is rejected, go different ways. The material that is under 3 inches and which contains all the dirt that came from the quarry is passed to the washing plant. The material above 3 inches goes through the regular crushing and screening process for manufacture into commercial sizes that do not require washing.

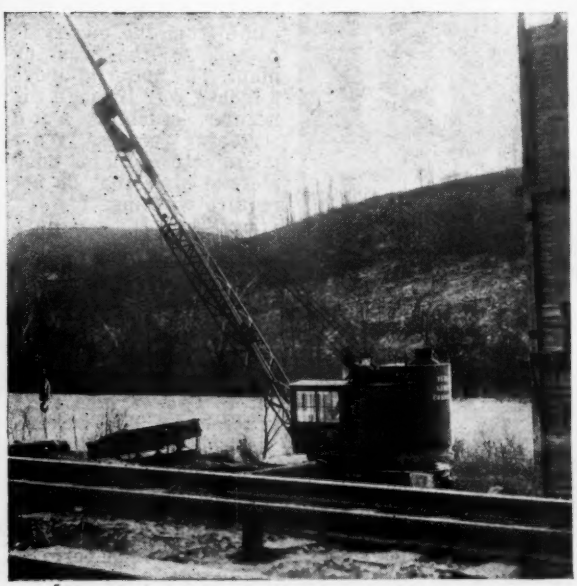
The first machines through which go rejections from the grizzly are two No. 7½ Gates type K gyratory crushers. The products of these crushers drop through to the boot of a No. 9 elevator, 75 feet between centers which carries it to two 48 inch x 24 foot revolving screens. The screens and elevator, as well as the two No. 7½ crushers are products of the Allis-Chelmers Mfg. Co., Milwaukee, Wisconsin. Each of the revolving screens used at this plant is ordinarily fitted with four sections of 1½ inch perforations, two sections of 2¼ inch perforations, and a jacket with 1⅛ inch perforations. Thus are secured two

sizes which go direct to bins, together with the product of the jacket and the rejections from the screen. These rejections are dropped back by gravity to a No. 6 Gates and a No. 5 McCully gyratory crusher located at the level of the No. 7½ crushers. These two machines reduce stone at about 2 inches. The stone is then taken up by a Stephens-Adamson 20 inch pan conveyor with 35 foot centers, which carries it to a No. 6 Allis-Chalmers elevator. This elevator passes the stone to another 48 inch by 24 foot Allis Chalmers revolving screen with 4 sections of 1 inch perforations, 2 sections of 1½ inch perforations and a jacket with ½ inch perforations. The product of this screen includes stone from 1½ inch to 1 inch, from 1 inch to ½ inch, from ½ inch to ¼ inch, together with ground limestone that would pass 36 mesh, and the tailings from the screen itself.

These tailings are dropped down to a 24 inch Stephens-Adamson pan conveyor, 20 feet between centers, which discharges at two No. 4 Gates crushers. The product of these No. 4's drops to a small 20 inch pan conveyor that fed the No. 6 elevator before mentioned. In other words, the rejections from the two 48 inch revolving screens first encountered in the process, are reduced as described and the tailings from this second reduction process are passed again through the process itself.

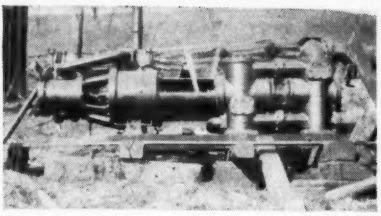
The ground limestone from the 48 inch by 24 foot revolving screen used for the tailings of the second revolving screen, is chuted to 2 double deck Universal Vibrating screens made by the Universal Vibrating Screen Company of Racine, Wisconsin. These screens are equipped with 3x3 and 6x6 mesh cloth, which yield a product that is more important in this than in most plants, as well be described later.

Reverting again to that early part of the process in which is given a description of the manner in which the grizzly screen separates at 3½ inch, we find that it is still necessary to describe the course of the material passed by the grizzly, together with what dirt may have entered the process from the quarry. This material passed by the grizzly is drawn off by a 24 inch belt conveyor, 30 feet between centers, which carries the stone to the boot of a No. 6 elevator, 75 feet between centers. This elevator discharges at a 48 inch by 24 foot Allis-Chalmers revolving screen similar to the other three screens used in the regular crushing plant. This screen drops its rejections, which run over 2 inches, back to a No. 5 gyratory. The material passed by the screens, all under 2 inch, is taken up by a 24 inch belt conveyor to the washing plant. A number of the illustrations show the way in which this conveyor connects the crushing and washing plants. At the time the plant was visited, work was going ahead on the steel gallery in which this belt is to run, and which will also house another belt, one which will carry material intended for stock piling. The method of stock piling and of transporting material across the river by aerial cableway will described later. By this time the washing plant is in operation, and the construction work on the



25 Ton McMyler-Interstate Crane Used for the Stock Piling System

Note Trough for Carrying Ashes to River

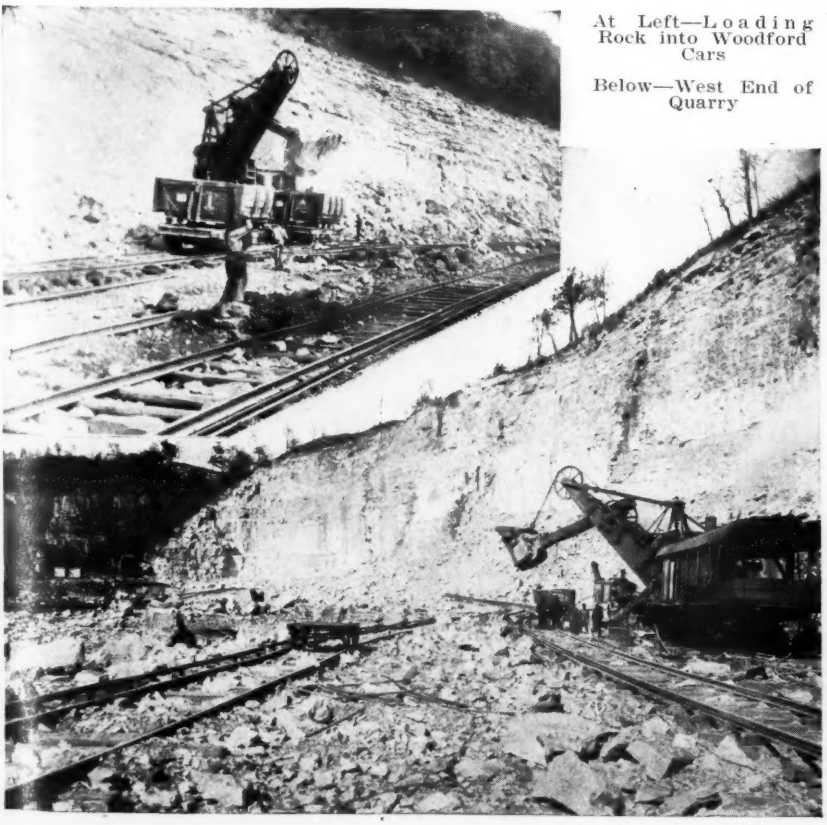


One of The Pumps Used in The Hydraulic Operation

Some More Views around the Virginian Limestone Corporation Plant at Klotz, Va.

At Left—Loading Rock into Woodford Cars

Below—West End of Quarry



PLYMOUTH

Gasoline Locomotive

Plymouth Gasoline Locomotive, Equip

Plymouth Locomotive Displaces Mules and Electric Hoist

Every day money is being lost by the continued use of slow and expe sive haulage methods.

Suddenly a light dawns. A better haulage method is installed. Ext man power is displaced. Infinitely more material is delivered, and the da saving astonishes.

Read the letter in the panel adjacent. If, in your opinion, your haula method is slow and expensive, ask us for literature and give us the oppo tunity of discussion and suggestion.

THE FATE-ROOT-HEATH CO.
Plymouth, Ohio

Fenton-Parker Material Co., San Diego, Calif.

This Letter Tells of Daily Saving

San Diego, Calif.

The Fate-Root-Heath Co.,
Plymouth, Ohio.

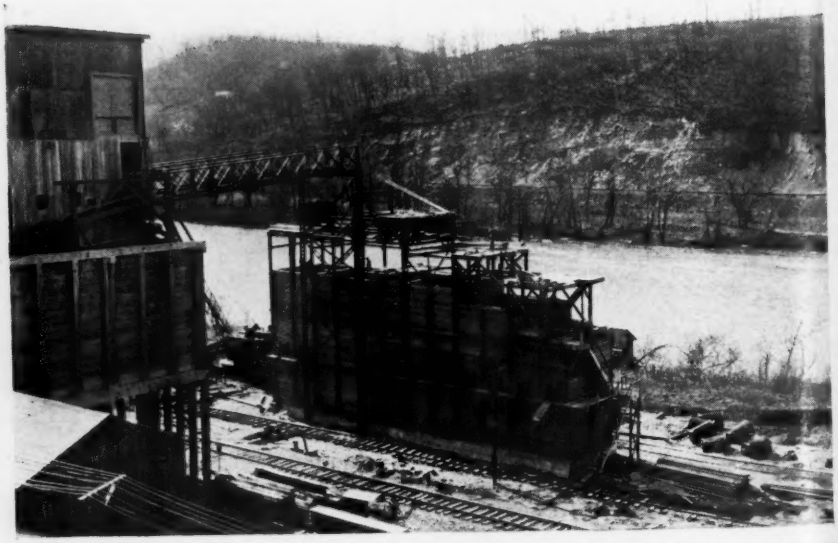
Gentlemen:

Prior to installing your 6-ton PLYMOUTH Locomotive, we were handling our tram cars with mules and electric hoists, a slow operation. The PLYMOUTH has eliminated both of these processes, and is getting more material to the plant on account of its speed and power, and at greatly reduced cost.

Its low cost of maintenance and simplicity of operation makes the PLYMOUTH a very desirable unit for any work of this nature.

Sincerely yours,
FENTON-PARKER MATERIAL CO.,
By Geo. S. Parker, V. Pres.

View of Virginian Plant from Loading Side. Picture Taken Before Washing Plant Was Built



View of Washing Plant in Process of Construction at Time Picture Was Taken

cableway has progressed to a considerable degree.

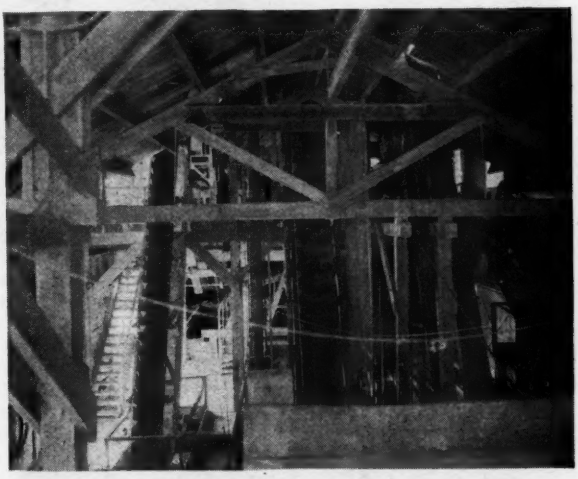
Material intended for the washing plant and carried to that plant by a 24 inch belt conveyor, is discharged in a 48 inch by 14 foot special Stephens-Adamson scrubbing screen. The screening section is equipped with ½ inch perforations. Water is introduced at this point to the scrubbing section of the screen. All the stone that passes ½ inch is dropped to a special Stephens-Adamson all steel sand washing and settling tank. Water overflow from this tank is sent back by flumes to the river, from which it is secured in the first place by 2 Allis-Chalmers turbine driven pumps with a capacity of 1200 gallons of water each per minute.

As stated, the material that is passed to the pashing tank is 2 inch size and under. The material is thoroughly cleaned and dewatered in this tank and then chuted to bins. Rejections from the screens are passed through six 54x72 inch Gilbert screens and then on to the Stephens-Adamson washing tank. As shown in one of the illustrations, the Gilbert screens will be located in pairs above each of the bin compartments, and will be mounted at successively lower levels in the direction in which the material is traveling. The screens over the first of these bin sections are equipped with 1⅛ inch perforations, over the second with $\frac{5}{16}$ inch perforations and over the third with ¼ inch perforations. The second settling tank is located over another compartment to which its product passes, the overflow water running to the same flume that carries the overflow from the first tank back to the river.

This means that there are in the washing plant compartments for 5 sizes, one compartment for each of the washing tanks and for each pair of Gilbert screens, in the three sizes described above. In addition to these bin compartments, there is a compartment into which discharges the conveyor that brings forward material for the piling system.

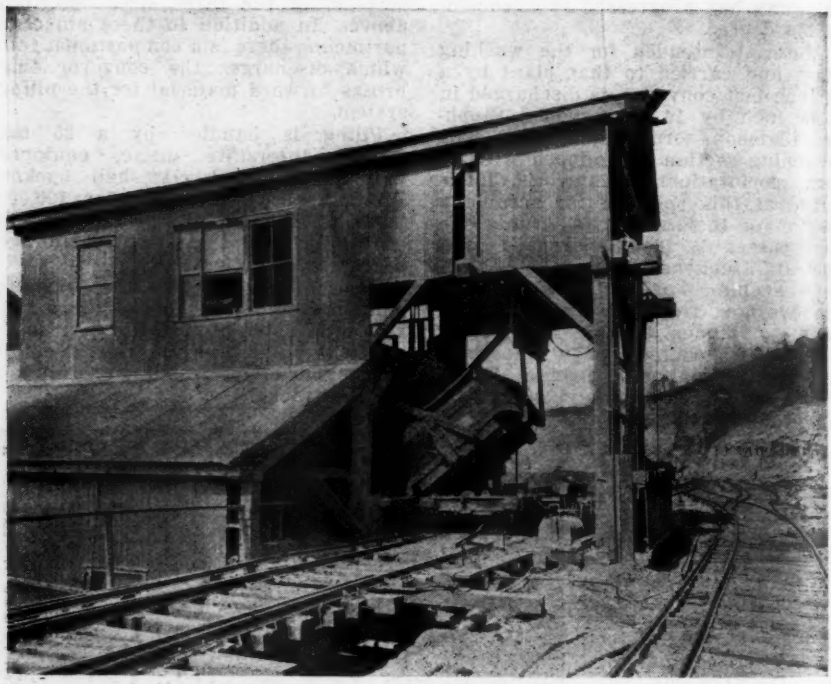
Piling is handled by a 25 ton McMyler-Interstate crane, equipped with a 1½ yard clamshell bucket. Piling space is provided for 100,000 yards of material. This material will be handled both in and out of storage by the McMyler crane.

Each of the bins in the washing plant just described has 4 bin gates, 2 on either side of each bin. All loading will be done from the sides of the plant, along which run railroad loading tracks.

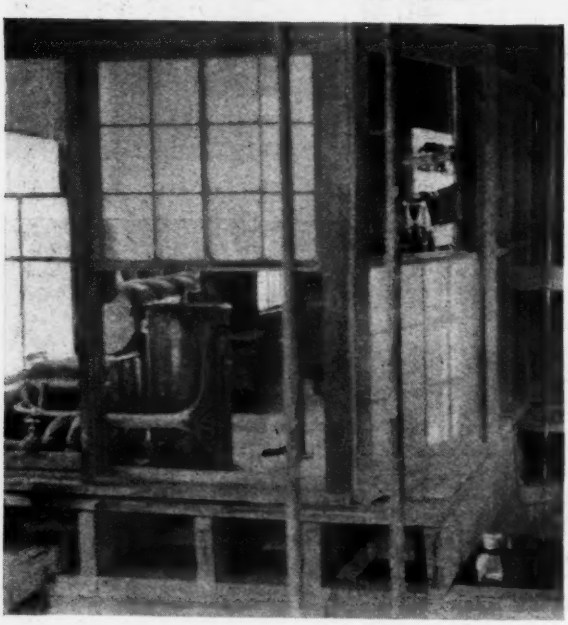


View of Elevators Taking Product to Upper Screen House

The Nozzle at Work Removing Overburden from Quarry



Cars of Stone Are Dumped by an Electrical Device Under the Control of the Quarry Car Operator



Quarry Car Operator's Tower Commands a View of All Parts of the Quarry

The washing plant is a substantial structure 98 feet long, 22 feet wide, and 66 feet high. It is of wooden construction and is built on heavy concrete foundations.

The idea of the aerial cableway which is to carry material across the New river, is that it will give the company loading facilities on two railroads instead of one. At this point the Norfolk & Western Railroad and the Virginian Railroad run parallel, one on either side of the river. The plant is on the Virginian and the new cableway will permit the company to enjoy all the advantages of the Norfolk & Western. This cableway has a capacity of 5,800 yards per day over a span of 1,200 feet. It was made by the Interstate Equipment Corporation of New York City.

The regular crushing plant is equipped with 3 special Caldwell screw conveyors. These conveyors are located under the loading tracks of the crushing plant, and higher than the loading track running by the washing plant. One of these special screw conveyors is so arranged that any mixture that a contractor may desire from dust to 2 inch stone can be made. In fact this particular conveyor is installed for the definite purpose of making a special concrete stone mixture for which there is a large demand. The other two conveyors are used for the purpose of piling ground limestone. It is necessary to handle this material in enclosed screw conveyors because of the fact that the fineness of the material would cause it to be blown away, if it were brought out into the open on a belt conveyor.

Device for Dumping Electric Quarry Cars Controlled by Car System Operator

The power used at the plant is steam generated from three 350 H. P. B. & W. water tube boilers. These furnish steam for a 700 H. P. cross-compound engine, which passes on its power to the plant through a rope drive. A 250 k.w. General Electric generator is used to generate the electricity used around the plant for the haulage system, for the illumination of the plant and quarters, and for a number of other purposes. From the boilers are also driven a straight line Sullivan compressor of 1000 cubic feet capacity and a Type 10 Ingersoll-Rand compressor of 1000 cubic feet capacity. A pipe line is also run from the boilers out to the river to furnish power for the two 6 inch turbine driven pumps for the washing operation.

Examination of the illustration which includes the boilers will show a trough cut in the concrete firing floor, parallel with the boiler fronts and just outside the firing doors. Into this trough are dropped all of the ashes drawn from the ash pits. A stream of water running through carries away the ashes to the river. Surely a simple ash disposal method.

The Virginian Corporation has voted itself out of a lot of trouble by the installation of a 100 ton Fairbanks track scale that automatically weighs cars of stone which, when loaded, drop down by gravity from the plant. The scale is in charge of an agent of the Virginian Railway Company, who records the weights and issues to the stone company receipts for the tonnages that he has checked. The scale is tested frequently and many of the disagreeable arguments about weight that occur so frequently at some plants are never found here.

The Virginian Limestone Corporation is on the grow. During the last year they have practically doubled the capacity of their plant and quarry, and are able to give considerably improved service with the piling system and the new cableway across the river. The plant which began a few years ago as a ballast production operation for the Virginian Railroad is now turning out commercial stone in all required sizes. As it stands today, with all the additional units that have been added since the first work was done, the company has a plant of which it can well be proud.

The production of limestone sand accounts for a considerable part of the plant's output. The company has been interested for many years in the production of this material at other points, and is pushing its sale more rapidly than the average crushed stone producer. The use of limestone sand in considerable quantities began years ago in Chicago when new city ordinances compelled the elevation of all railroads entering the city, and consequently necessitating the building of about 300 miles of concrete retaining walls. The question of having

limestone sand specified in the work came up for discussion, and the engineers of the railroads, unfamiliar with the use of this material, had extensive laboratory tests made. Mr. E. H. Lee, engineer for the Chicago and Western Indiana Railway, and the Belt Railway of Chicago, was selected to make the tests, as a result of which the use of limestone sand (screenings) was permitted in the construction of the retaining walls for the track elevating work done by the railroads in Chicago. More than 80 per cent of these walls were constructed of concrete in which limestone sand was used.

At that time the owners of the Virginian Limestone Corporation were extensively engaged in the production of crushed stone for the Chicago market and were consequently greatly interested in the new standing acquired by limestone sand. They got into the business on a quite large scale and sold a great deal of material. When they came to build the plant in Virginia, they investigated fully the possibilities for production of limestone sand from the material they were to quarry. Tests showed that a grade of limestone sand much better than the Chicago product can be produced in Virginia. Limestone quarried by the Virginian Limestone Corporation is of higher grade than that quarried in the vicinity of Chicago. It is much harder and the limestone sand is a great deal sharper. Engineers to whom samples of both products have been submitted, are agreed that the Virginia product is far superior to that manufactured in Chicago. Since the Chicago product has come into such demand, the officials of the Virginian Limestone Corporation believe that limestone sand produced in Virginia has even a better future before it than that made in Chicago.

Progress on Signal Mountain Cement Plant

The first unit of the $3,000,000 plant of the Signal Mountain Portland Cement Company now being erected at the foot of Signal Mountain near Chattanooga, will be placed in operation during the month of June, weather conditions permitting the continuance of normal construction schedules, according to announcement made recently by Col. Clarence Steward, vice-president and acting head of the institution. Forces will be doubled and work carried on 24 hours a day.

The first unit of the 5,000 barrel plant will have a daily capacity of 1,250 barrels. Attempt will be made to put the second unit in operation a month or two later, after the first one is in running order. Over $1,000,000 has already been expended on the plant.

The Signal Mountain Portland Cement Company, which promises to become a leading Southern industry, was organized under the laws of the state of Delaware and was later domesticated in the state of Tennessee. The officers of the new enterprise are John L. Senior, president; J. P. Hoskins, treasurer; Ralph Law, secretary, and W. A. Sadd, Chairman of the Board of Directors. The actual work of building the plant is in the hands of Mr. B. R. Alford, superintendent of construction.

The location of the new plant is about five miles from Chattanooga. There is a mile of waterfront along the Tennessee river, from which point the company's land slopes upward and lies along the mountainside. The location is regarded as fortunate not only because of the proximity of the necessary raw materials and of the contour of the property, which permits very satisfactory utilization of gravity, but also because of the economic value of transportation facilities available to employees. The Chattanooga Traction Company runs a line through the property, and the homes, schools, churches and theatres of Chattanooga are easily accessible. This feature eliminates the necessity for building employee quarters and makes possible a saving of approximately $200,000.

Chattanooga was selected as a good location for the manufacture and distribution of cement for a number of reasons. Chief among these is the growing demand for the product in the territory served and the comparatively small production facilities. Of the 115 cement plants operating in the United

States, only about 15 are located in that group of states which comprise the section of the south, southeast and southwest. These plants produce not much more than 10 per cent of the cement manufactured in the whole country.

Markets are assured all over the projected distribution area. The new enterprise is surrounded by prosperous states in which the demand is continuously growing. The completion of the Wilson dam at Florence, Alabama, will permit shipment of a considerable part of the output by water over a large territory. Other parts are served by good rail connections.

The mill is being constructed along modern and approved lines. The management contemplates the erection of a very fine plant and is spending money to bring this about. No new cement plants have been put in operation in this section for the past 10 years, although most have been modernized by additions and alterations. Aside from the new enterprises going ahead in Birmingham, the Signal Mountain plant will enjoy the distinction of being the only one for a considerable distance around built from the beginning along modern lines.

The plant is located on the Dixie Highway, which intersects the entire length of the property. For the avoidance of possible accidents a tunnel will be built under the road for the transportation of plant products and raw materials. Thus good traffic to the city is assured in all seasons. The fact that the plant is within the shipping district of Chattanooga will give access to all the principal railroads of the south. The Tennessee river will afford water supply for the site chosen as well as river transportation for coal and finished products.

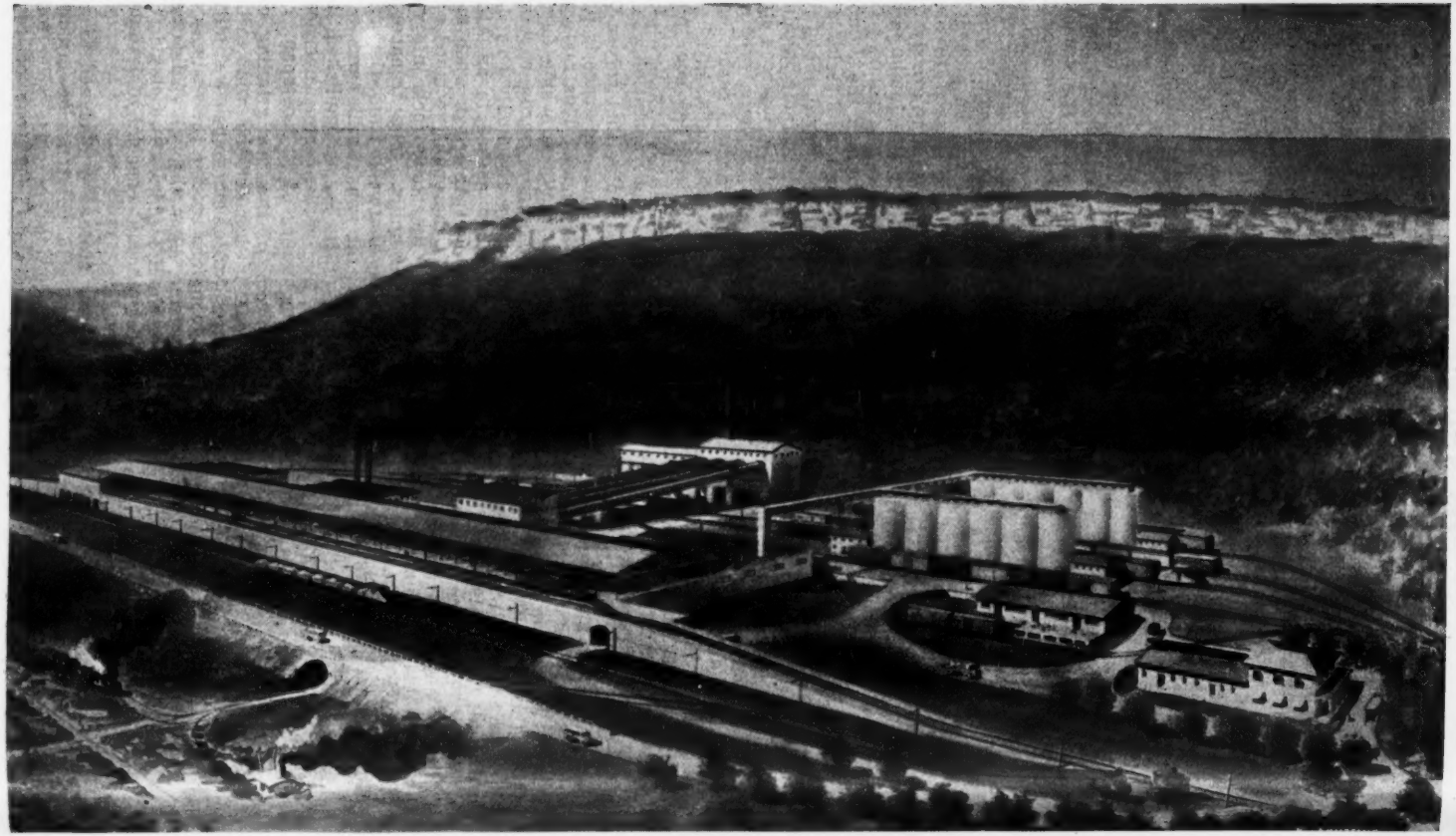
The limestone quarry is located 1800 feet west of the plant, and includes 100 acres of limestone that runs 400 to 500 feet down and is expected to last 75 years. The stone above ground level has a slope of about 5 degrees west. The operating face to start with will be 800 feet long by 30 feet high. This can be increased to 2000 feet by 175 feet high. Overburden is negligible and will not impose any added cost on the quarry operation. The drilling plan has not been decided upon as yet, although it is known that electric well drills and jack hammers will be employed. Loading will be done with a Bucyrus shovel with 3½ yard bucket, dumping into Western air side dump cars. Haulage to the plant will be accomplished by a 50-ton Baldwin locomotive, switch type. The clay field, as shown in one of the sketches herewith, is located just across the Dixie Highway from the plant. The deposit includes 75 acres of clay running to a depth of 25 feet. The occurrence is in a solid bed that requires no stripping. Loading will be done by an Erie type B shovel into Western air side dump cars.

Limestone brought to the plant by the means described will be taken up on a trestle leading to the crushing plant. The cars will be dumped by air into a hopper above a No. 21 Allis Chalmers gyratory crusher. This machine will reduce stone to 8 inch size, after which it will be picked up by an elevator and passed to steel storage tanks. A traveling grizzly will carry this product to two Jumbo mills, which will reduce to 1½ inches. The material running through the Jumbos will be plus 2 inch minus 8 inch. The Jumbo crushers are located above the primary crusher and their product passes through it to the raw rock storage. These Jumbo crushers, products of the Williams Patent Crusher and Pulverizer Co., of St. Louis, Mo., have a capacity of 300 tons per hour of 8 inch stone and will reduce it to 1½ inch and finer in one operation.

In the same building that serves for storage of raw limestone space is provided for storing clay. This material is brought up in Western side dumping cars of 12 cubic yards capacity each. These cars are dumped by air. The clay is then passed to an Allis-Chalmers 26 foot American wash mill in which it is thoroughly washed and passed with limestone rock into the wet grinding mills. The transportation of the material from the raw storage to the wash mills and raw grinding mills is accomplished by Shepard 2½ yard electric overhead travelling cranes of 80 foot span.

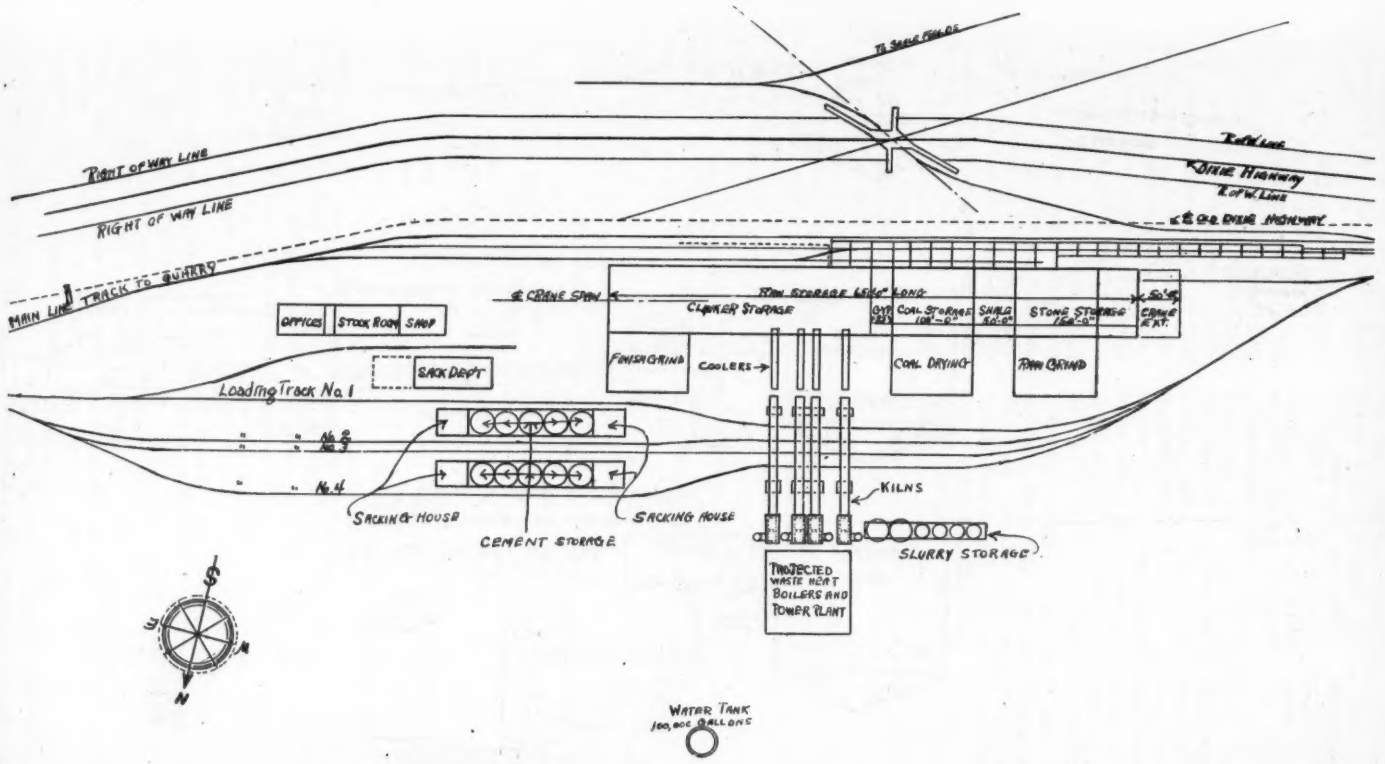
The work of the raw grinding department is handled by four Allis-Chalmers 7x22 foot compeb wet mills. These compebs receive their supply of stone from bins through Allis-Chalmers style H feeders. The clay is introduced through specially designed feeders.

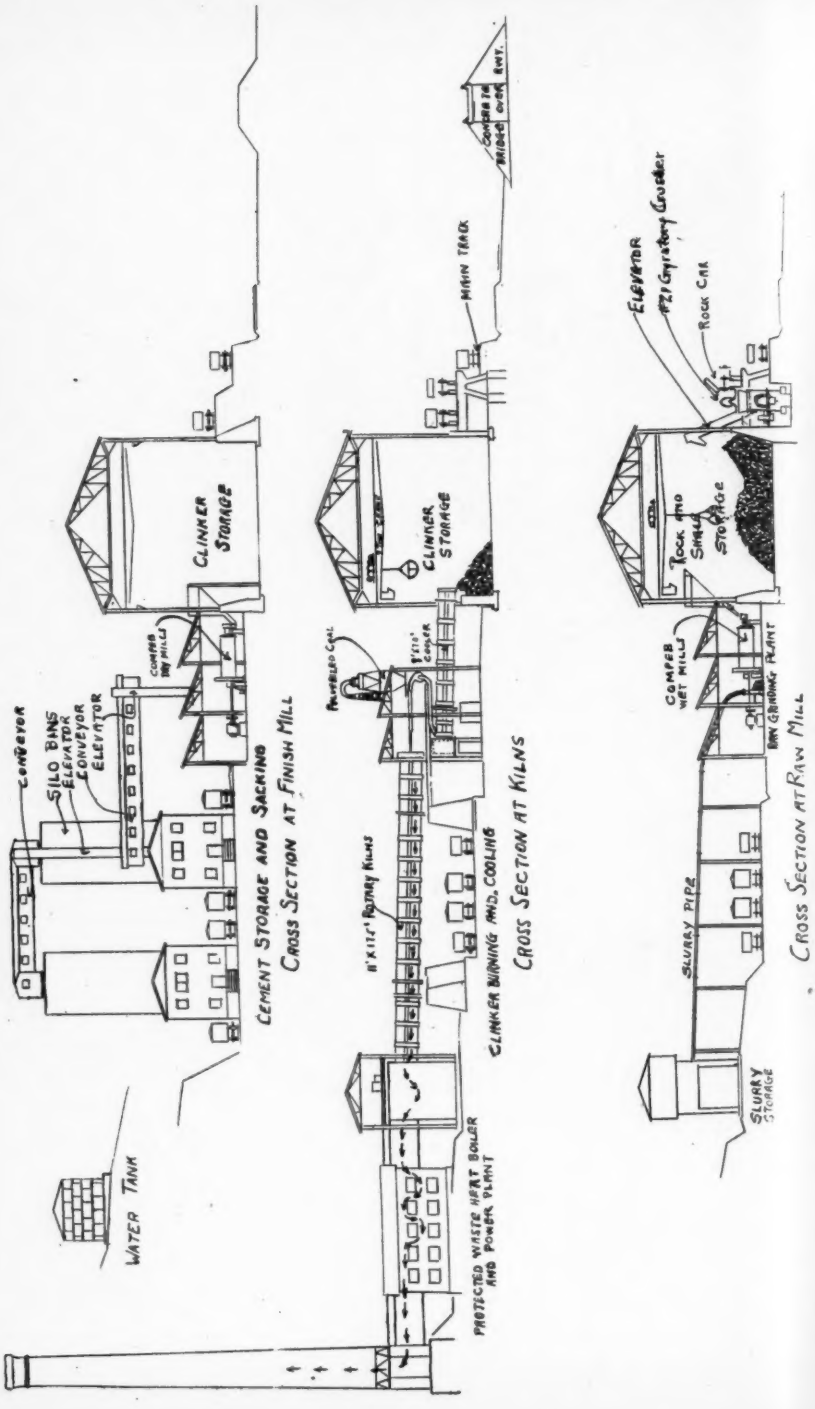
The raw storage is designed to accommodate 15,000 tons of crushed stone, 5,000 tons of clay, 2,500 tons of gypsum and 5,000 tons of coal.



Signal Mountain Portland Cement Plant as It Will Appear When Completed

Signal Mountain Portland Cement Plant as It Will Appear When Completed




CLINKER STORAGE
CONVEYOR
SILO BINS
ELEVATOR
CONVEYOR
ELEVATOR
COMPEB BALL MILLS
CEMENT STORAGE AND SACKING
CROSS SECTION AT FINISH MILL
WATER TANK
PROTECTED WASTE HEAT BOILER AND POWER PLANT
11'X11'-6" ROTARY KILNS
PULVERIZED COAL
CLINKER BURNING AND COOLING
CROSS SECTION AT KILNS
MAIN TRACK
CONVEYOR BRIDGE OVER RWY.
CLINKER STORAGE
ELEVATOR
#21 Gyratory Crusher
ROCK CAR
ROCK AND SLAG STORAGE
COMPEB WET MILLS
RAW GRINDING PLANT
SLURRY PIPE
SLURRY STORAGE
CROSS SECTION AT RAW MILL

Under the same roof is the clinker storage, designed to hold 150,000 barrels of clinker.

After the limey and clayey components of the raw mix have been thoroughly ground in the compeb wet mills to the requisite fineness, the resulting slurry is taken up by an Allis-Chalmers 4 inch rubber lined slurry pump and passed through pipe lines to the slurry storage tanks that have a capacity of about 6,000 barrels. Compressed air and mechanical methods will be used to agitate the slurry.

The kilns, 175 feet in length with diameters of 11 feet, were designed and built by the Allis-Chalmers Company. Temperatures range from 1200 degrees F., at the feeding end to 2850 degrees F., at the burning zone near the firing end. Four of these kilns will be utilized in the complete 5,000 barrel plant. Each kiln will have a capacity of 1,250 barrels daily and each unit will employ one kiln. Thus, in the first unit which the company intends to put in running order as soon as possible, one kiln will be used. The other units will soon be added.

The unit design of construction makes it possible to carry the project to completion while the first unit is in operation. In this way the company will be in a position to help meet the demands of the territory served while the plant is still under construction. It may be well to mention, while speaking of unit construction, that the plant has been so designed that other units of various kinds can be added later without disturbing what is now being built. In other words, if it is desired, after the complete 5,000 barrel plant is built, to considerably increase the capacity, other units can be built without changes in the existing layout.

Firing in the rotary kilns will be with coal which will first be dried in an Allis-Chalmers 8x55 foot Ebro type dryer. It will then be pulverized by fuller mills, elevated by blower to the pulverized coal bin above the feeder, and from there blown into the kiln.

It is worthy of notice that the transportation of the mix from the feed bin to the clinker storage utilizes gravity to the fullest extent. After coming from the kilns the clinker drops down to an 8x70 foot rotary cooler through which it passes and falls direct to the storage.

Clinker will be taken out of storage by an overhead travelling crane and from there passed on to four 7x22 foot compeb dry mills. After these complete the work of grinding it to 200 mesh, the product will be taken up by style B bucket elevators and 16 inch screw conveyors and passed on to the silo bins for finished cement. Sacking houses are located in four places, one at each end of two series of six cement storage tanks. Across loading track No. 1 from the cement storage bins, silos, and sacking houses, is the sack department where sacks are prepared for use in the bagging machines.

When complete the plant will present an imposing enough appearance. The raw storage will be 650 feet long and 60 feet wide. The raw grind building will be 150 feet long, the coal drying building 100 feet long and the finish grind building 150 feet long. All of these buildings will be 60 feet wide. The complete plant itself will be more than 2,000 feet in length. On the grounds will be located offices, shops and stock rooms, together with such other necessary parts of a large enterprise, as water storage tanks, etc.

Outcroppings of suitable coal have been found within a few miles of the plant. Some of this coal will come from the top of Signal Mountain, directly above the plant itself, some from Raccoon Mountain by railroad and some from mines at present operating in that section. The general impression of the plant is that it is of very simple design and employs to good effect the natural advantages of the property. The operation will apparently be flexible. The method of construction that will permit of increasing the capacity 100 per cent in the same ground space without interfering with operations, is very desirable. While it is true that some of the dimensions of the plant may seem large for the production contemplated, it is also true that it is sufficiently compact to make supervision easy. A notable feature is the small amount of elevating and conveying machinery that is used. In this plant they "ride the stone" very little.

The company will begin operations on electrical power furnished by a local central station. If it becomes advisable to do so at a later date, waste heat boilers will be added and machinery turned over by steam made from the heat thus conserved. One of the sketches herewith shows how a waste heat boiler could be added to the plant.

Quarry Accidents in the United States

In 1921 the quarry industry in the United States showed fewer fatal accidents to employees and slightly more nonfatal injuries than in 1920. According to reports from operating companies to the Bureau of Mines, the fatality rate declined from 2.31 per thousand employees in 1920 to 2 per thousand in 1921, and the injury rate rose from 145.51 to 174.54, these rates being based upon a standard of 300 working days per year.

Reports from 1,764 operators showed 77,185 employees, who worked 17,987,547 shifts, an average of 233 workdays per man. As compared with 1920, these figures indicate an increase of 47 operating companies, a loss of 5,139,101 shifts, and a reduction of 34 workdays per man.

Operations inside the quarries showed 49,292 employees, 10,824,541 shifts, and 220 average days per man; work at crushers and rockdressing plants showed 27,893 employees, 7,163,006 shifts, and 257 workdays per man. Each of these figures represents a reduction as compared with 1920.

Accidents during the year resulted in the death of 120 men and the injury of 10,465, as compared with 178 killed and 11,217 injured in 1920.

The accident rates for quarries producing stone for building or monumental work were 3.23 killed and 104.24 injured per thousand men employed, as compared with 1.22 killed and 152.37 injured in 1920; the rates for quarries where the stone is crushed were 3.40 killed and 230.51 injured per thousand employees, as compared with 2.66 killed and 213.9 injured in 1920. At the outside plants at the building-stone quarries the rates were 0.38 killed and 158.90 injured as compared with 0.95 killed and 126.30 injured; at crushers and cement mills the rates were 1.28 killed and 177.39 injured, as compared with 1.73 killed and 183.77 injured in 1920.

Of the 10,585 accidents at all quarries during the year, 1.13 per cent were fatal, 0.09 per cent resulted in permanent total disabiltiy, 3.12 in permanent partial disability, 17.91 per cent in temporary disability of more than 14 days, and 77.75 per cent in disability not exceeding 14 days but more than the remainder of the shift on which the accident occurred.

Number of men employed, days' work performed, and number of men killed and injured at all quarries in the United States, 1911 to 1921.

Year	Average days active	Men employed: Actual number	Men employed: Equivalent in 300-day workers (calculated)	Total shifts	Number killed: Total	Number killed: Per 1,000 300-day workers (calculated)	Number injured: Total	Number injured: Per 1,000 300-day workers (calculated)
1911	228	110,954	84,417	25,325,094	188	2.23	5,390	63.85
1912	249	113,105	93,837	28,151,042	213	2.27	6,552	69.82
1913	246	106,278	87,141	26,142,237	183	2.10	7,739	88.81
1914	233	87,936	68,187	20,456,157	180	2.64	7,836	114.92
1915	246	100,740	82,447	24,734,224	148	1.80	9,671	117.30
Aver for 5 yrs.	240	103,803	83,206	24,961,750	182	2.19	7,437	89.39
1916	253	90,797	76,457	22,937,178	173	2.26	13,427	175.62
1917	261	82,290	71,525	21,457,357	131	1.83	13,242	185.14
1918	260	68,332	59,285	17,785,504	125	2.11	8,719	147.07
1919	253	75,505	63,794	19,138,308	123	1.93	9,199	144.20
1920	267	86,488	77,089	23,126,648	178	2.31	11,217	145.51
Aver. for 5 yrs.	259	80,682	69,630	20,888,999	146	2.10	11,161	160.29
Av. for 10 yrs.	249	92,243	76,418	22,925,375	164	2.15	9,299	121.69
1921	233	77,185	59,958	17,987,547	120	2.00	10,465	174.54

Since 1915 the bureau's statistics of accidents at quarries have divided all injuries into five main classes as follows: 1, fatalities; 2, permanent total disabilities; 3, permanent partial disabilities; 4, temporary disabilities lasting more than 14 days; 5, temporary disabilities of more than the remainder of the shift on which the accident occured but not to exceed 14 days.

During the 7 years covered by the table that follows, 76,938 accidents at quarries have been reported to the Bureau of Mines. Of these, 998 (1.30 per cent) resulted fatally, 101 (0.13 per cent) resulted in permanent total disability, 2,374 (3.09 per cent) in permanent partial disability, 12,692 (16.50 per cent) in

disability of more than 14 days, and 60,773 (78.99 per cent) in disability of 1 to 14 days, inclusive. During this period more than 147,000,000 shifts were worked by all quarry employees, so that the volume of exposure to occupational hazards indicates that the foregoing distribution of accidents may be accepted as typical of the severity of accidents that occur to persons engaged in the industry.

Comparison of quarry accidents, 1915 to 1921.

Injury	1915	1916	1917	1918	1919	1920	1921
1. Fatal	148	173	131	125	123	178	120
2. Serious (time lost more than 14 days):							
A. Permanent disability—							
Total*	16	26	10	7	23	10	9
Partial†	507	446	354	185	225	327	330
B. Others	1,365	2,194	2,266	1,466	1,612	1,893	1,896
3. Slight (time lost, 1 to 14 days, inclusive)	7,783	10,761	10,612	7,061	7,339	8,987	8,230
Total	9,819	13,600	13,373	8,844	9,322	11,395	10,585
Men employed	100,740	90,797	82,290	68,332	75,505	86,488	77,185

**Permanent total disability.*—Loss of both legs or arms, one leg and one arm, total loss of eyesight, paralysis, or other condition permanently incapacitating workman from doing any work of a gainful occupation.

†Permanent partial disability.—Loss of one foot, leg, hand, eye, one or more fingers, one or more toes, any dislocation where ligaments are severed, or any other injury known in surgery to be permanent partial disability.

The quarries are classified according to the kind of rock, as follows: Cement rock, granite, limestone, marble, sandstone and bluestone, slate, and trap rock. Separate statistical tables are presented for each group and for all groups combined. The tables show the number of persons employed, the average number of working days per man, the total number of shifts worked by all employees, and the number of men killed or injured, thus making it possible to base fatality and injury rates throughout this report on a uniform number of days during which the workmen were exposed to the hazards of their occupations.

A summary of the more important figures for all quarries in the United States during the years 1921 and 1920 is given in Table 3. The percentage of accidents due to any one cause is given in Table 4. Wherever possible, comparative figures for previous years are given.

Table 3.—All quarries: Men employed and number killed and injured, by kind of quarry, during the years ended December 31, 1921 and 1920.

Kind of quarry	Active operators	Men employed—Actual number	Men employed—Equivalent in 300-day workers (calculated)	Killed—Number	Killed—Per 1,000 300-day workers	Injured—Number	Injured—Per 1,000 300-day workers	Widows	Orphans
1921									
Cement rock	70	10,815	10,459	20	1.91	2,233	213.50	10	19
Granite	297	9,479	7,010	18	2.57	940	134.09	10	22
Limestone	935	39,551	29,399	58	1.97	5,248	178.51	32	81
Marble	45	4,549	4,025	6	1.49	406	100.87	3	4
Sandstone and bluestone	194	3,928	2,394	3	1.25	374	156.22	2	6
Slate	80	3,564	2,848	4	1.40	385	135.18	2	1
Trap rock	143	5,299	3,823	11	2.88	879	229.92	6	12
Total, 1921	1,764	77,185	59,958	120	2.00	10,465	174.54	65	145
1920									
Cement rock	74	13,251	14,165	39	2.75	2,585	182.49	20	32
Granite	339	12,735	10,664	22	2.06	1,392	130.53	11	12
Limestone	925	43,151	37,182	96	2.58	5,321	143.11	50	72
Marble	42	4,438	4,349	4	.92	400	91.98	3	3
Sandstone and bluestone	163	4,466	3,540	2	.56	356	100.56	1	4
Slate	75	3,496	3,364	5	1.49	364	108.20	3	9
Trap rock	99	4,951	3,825	10	2.61	799	208.89	6	12
Total, 1920	1,717	86,488	77,089	178	2.31	11,217	145.51	94	144

Granite quarries employed 9,479 men during 1921, or 3,256 men (26 per cent) less than in 1920. In the pits proper 7,105 men were employed, while

2,374 men worked at the outside rock-dressing plants. The total working time was 2,102,854 shifts, an average of 222 days per man or 29 days per man less than the year before.

Accidents resulted in the death of 18 men (4 less than in 1920) and the injury of 940 (452 less than in 1920). The accident rates per thousand 300-day workers were therefore 2.57 killed and 134.09 injured, as compared with 2.06 killed and 130.53 injured in the preceding year.

The main causes of accidents inside the quarries were flying objects, handling rock, machinery, falls or slides of rock, and falling objects; the first cause named was responsible for one-third of all injuries to men in the pits. At the rock-dressing plants outside the quarries, nearly one-half of the injuries were due to flying objects, the others being due mainly to handling rock, hand tools, machinery, and falling objects.

Eight hours per day constituted the standard workday for 55.7 per cent of the men in the quarries, 9 hours for 16.8 per cent, and 10 hours for 16 per cent. At the outside plants 8 hours was the standard workday for 71.1 per cent of the men, 9 hours for 7.5 per cent, and 10 hours for 11.8 per cent.

Limestone quarries constitute the largest branch of the quarry industry, usually employing about half of all quarry workers in the United States. Companies producing limestone in 1921 employed 39,551 men, 8 per cent less than in 1920. The total working time for all employees was 8,819,813 shifts, each man averaging 223 workdays during the year, a loss of 36 days per man from the year before.

Accidents to employees resulted in 58 deaths and 5,248 injuries, or 1.97 fatalities and 178.51 injuries per thousand 300-day workers, the former being smaller and the latter being larger than the corresponding rate for the preceding year.

Most of the injuries inside the quarries were caused by handling rock at face, flying objects, haulage, falls or slides of rock or overburden, machinery, falling objects, and falls of persons. At the outside plants the accidents resulted mainly from machinery, flying objects, falling objects, falls of persons, hand tools, and haulage. The distribution of the accidents is given in Table 2.

The operators' reports showed that 21.3 per cent of the men working inside the pits were employed 8 hours per day, 23.4 per cent 9 hours, and 43.8 per cent 10 hours. Of the employees at the outside plants, 9 per cent worked 8 hours per day, 22.5 per cent 9 hours, and 42.9 per cent 10 hours.

Quarries producing sandstone and bluestone employed 3,928 men, of whom 3,090 worked inside the pits; 838 worked at the outside plants where they were engaged in crushing or dressing the stone. The working time for all employees was equivalent to 718,310 shifts, an average of 183 days per man, or 55 workdays less than in 1920.

Accidents resulted in the death of 3 men and the injury of 374, the resulting rates being 1.25 killed and 156.22 injured per 1,000 men employed (300-day workers). The corresponding rates for the preceding year were 0.56 killed and 100.56 injured. About 78 per cent of the accidents in 1921 occurred at quarries in New York, Ohio, and Pennsylvania; these three States employed 70 per cent of all employees engaged producing sandstone and bluestone in the United States.

Most of the injuries were due to handling rocks, flying objects, falls or slides of rock or overburden, machinery, and falling objects, in the order stated. The total number of injuries represents an actual increase of 18 over the year 1920.

Reports received from the operating companies indicated that among the workmen inside the quarry pits 23.3 per cent were employed on the basis of 8 hours per day, 24.1 per cent on the 9-hour basis, and 50 on the 10-hour basis. Among the men employed at the outside plants, the 8-hour day prevailed among 18.1 per cent, the 9-hour day among 25.5 per cent, and the 10-hour day among 52.5 per cent.

Reports from 70 companies operating cement-rock quarries showed that they employed 10,815 men, of whom 3,432 worked in and about the pits proper, and 7,383 worked at the outside plants and mills. The men averaged 290 workdays during the year, and worked an aggregate of 3,137,789 shifts. The working time represents a loss of 31 days per man as compared with 1920, while the total number of shifts indicates a loss of 26 per cent.

Accidents killed 20 and injured 2,233 men, or 1.91 killed and 213.50 injured

per 1,000 employees (300-day workers). For 1920 the corresponding rates were 2.75 killed and 182.49 injured. Of the 20 fatalities, 5 occurred in California, 3 in Illinois, and 2 each in New York and Pennsylvania.

The leading causes of accidents inside the quarries were haulage equipment, falls or slides of rock, flying objects, machinery, falling objects, handling rock, and falls of persons. Most of the injuries to employees at the outside plants were due to falling objects, machinery, flying objects, falls of persons, hand tools, and burns.

The established length of the working day at cement-rock quarries was for men inside the pits, 8 hours for 10.7 per cent of the workers, 9 hours for 19.8 per cent, and 10 hours for 54 per cent. At the outside plants and mills, 17.7 per cent of the men were employed on the basis of 8 hours per day, 0.7 per cent 9 hours, 7.7 per cent 10 hours, and 19.5 per cent 12 hours.

Reports covering accidents at marble quarries were received from 45 plants that were operated part or all of the year. The operators reported the number of men working as 4,549 and the total working time as 1,207,467 shifts, an average of 265 days per man. Of the total number of employees, 2,138 men worked in the quarries and 2,411 worked at the outside rock-dressing plants. An increase in marble quarrying operations is indicated by the fact that more men were employed in 1921 than in any year since 1916.

Accidents resulted in 6 fatalities and 406 injuries during the year, thus indicating a fatality rate of 1.49 and an injury rate of 100.87 per 1,000 employees (300-day workers) as compared with rates of 0.92 killed and 91.98 injured in 1920. Of 170 nonfatal injuries to men working inside the quarries, the majority were due to machinery, drilling and channeling, flying objects, handling rock at face, and falls of persons. Of the 236 injuries at the rock-dressing plants, the main causes were handling rock, machinery, hand tools, flying objects, and falling objects.

For work inside the quarries proper, the reports showed that the 8-hour day prevailed among 36 per cent of the employees, the 9-hour day among 31.8 per cent, and the 10-hour day among 30.5 per cent. Among the men working at the outside plants, 69.4 per cent were employed on the basis of 8 hours per day, 27.9 per cent 9 hours, and only 2.6 per cent 10 hours.

Slate quarries operating in 1921 employed 3,564 men, each of whom averaged 240 work-days during the year, or a total of 854,396 shifts in all. As compared with 1920 the operating time represents a loss of 49 days for each employee. Of the total number of workmen, 2,695 were employed in the quarries and 869 at the outside plants; the former averaging 232 and the latter 263 working days during the year.

Accidents killed 4 men and injured 385 resulting in a fatality rate of 1.40 and an injury rate of 135.18 per thousand 300-day workers as compared with 1.49 and 108,20, respectively, for the preceding year. Of the 280 injuries to men in the quarries, the main causes were handling rock at face, falls or slides of rock, flying objects, machinery, and nails and splinters. At the rock-dressing plants most of the 105 injuries were due to handling rocks, nails and splinters, and machinery.

Nearly all of the employees at slate quarries were reported as working on the basis of 9 hours per day, the number so reported being 2,200 or 81.6 per cent of the total; 14.4 per cent worked 10 hours per day. At the outside plants 73.6 per cent of the men worked 9 hours, and 26.4 per cent worked 10 hours per day.

Reports received from 143 operators of traprock quarries for 1921 showed 5,299 men employed and a total working time of 1,146,918 shifts, an average of 216 shifts per man. In the quarries proper 3,945 men were employed, while 1,354 men worked at the crushers and other outside plants. Though the figures for 1921 seemingly show an increase of 348 employees over 1920 this apparent increase is from the inclusion in 1921, of employees at traprock quarries in California, who in 1920 were included with the employees at granite quarries, as reported by the California Industrial Accident Commission. After allowance for inclusion, the reports for 1921 represent an actual reduction of approximately 20 per cent in employees and 23 per cent in total shifts worked.

Accidents during the year resulted in 11 deaths and 879 injuries to the workmen; 8 of the fatalities and 680 injuries occuring inside the pits and 3 fatalities and 199 injuries occurring at the outside plants. The accident rates per thousand 300-day workers were 2.88 killed and 229.92 injured, as compared

with 2.61 killed and 208.89 injured in 1920. In the quarries proper most of the accidents were caused, by handling rock at face; flying objects, falls or slides of rock, machinery, haulage, and falling objects. At the outside shops the main causes of injuries were flying objects, machinery, haulage, falls of persons, and falling objects.

The standard working time inside the quarries was 8 hours for 10 per cent of the men, 9 hours for 26.5 per cent, and 10 hours for 31.7 per cent. In the outside plants 9.1 per cent of the employees worked 8 hours per day, 29.2 per cent 9 hours, and 39.7 per cent 10 hours.

Table 4 compares the percentage of accidents from various causes in the quarries and at outside work. The table shows the percentage of fatalities by causes for the entire industry, the percentage of accidents inside the quarries. The percentages of accidents inside and outside the quarries show more nearly the true hazard of each branch of the industry than those in the first column, based on the industry as a unit.

Table 4.—All quarries: Causes of fatalities and injuries, showing percentage due to each cause and corresponding rates per 1,000 300-day workers employed during the year ended December 31, 1921.

Cause of accident	Number killed: Per cent of total, Grand total	Number killed: Per cent of total, Class total	Number killed: Per 1,000 300-day workers, Grand total	Number killed: Per 1,000 300-day workers, Class total	Number injured: Per cent of total, Grand total	Number injured: Per cent of total, Class total	Number injured: Per 1,000 300-day workers, Grand total	Number injured: Per 1,000 300-day workers, Class total
	1	2	3	4	5	6	7	8
In and about quarry:								
1. Falls or slides of rock or overburden	16.67	25.00	0.33	0.55	5.92	10.28	10.34	17.18
2. Handling rock at face	3.33	5.00	.07	.11	10.94	18.99	19.10	31.73
3. Timber or hand tools	....	....	....	....	2.30	4.00	4.02	6.68
4. Explosives	14.17	21.25	.28	.47	1.89	3.28	3.30	5.49
5. Haulage	10.00	15.00	.20	.33	5.29	9.19	9.24	15.35
6. Falls of persons	5.83	8.75	.12	.19	2.77	4.81	4.84	8.04
7. Falling objects (other than 1 and 2)	1.67	2.50	.03	.06	3.27	5.67	5.70	9.48
8. Flying objects	3.33	5.00	.07	.11	8.87	15.39	15.48	25.72
9. Electricity	1.67	2.50	.03	.06	.17	.30	.30	.50
10. Drilling and chanelling (by machine or hand)	.83	1.25	.02	.03	2.26	3.92	3.93	6.54
11. Machinery	6.67	10.00	.13	.22	5.26	9.12	9.17	15.24
12. Nails, splinters, etc.	....	....	....	....	1.13	1.96	1.97	3.27
13. Boiler and air-tank explosions	1.67	2.50	.03	.06	.04	.07	.07	.11
14. Burns	....	....	....	....	.95	1.66	1.67	2.77
15. Other causes	.83	1.25	.02	.03	6.55	11.36	11.42	18.99
Total	66.67	100.00	1.33	2.22	57.61	100.00	100.55	167.09
In outside works:								
16. Haulage	4.17	12.50	.08	.21	2.83	6.67	4.94	12.40
17. Machinery	8.33	25.00	.16	.42	5.52	13.03	9.64	24.21
18. Hand tools	....	....	....	....	3.43	8.09	5.99	15.04
19. Nails, splinters, etc.	....	....	....	....	1.93	4.55	3.37	8.46
20. Electricity	5.83	17.50	.12	.29	.63	1.49	1.10	2.76
21. Falls of persons	3.33	10.00	.07	.17	3.32	7.82	5.79	14.53
22. Falling objects (rocks, timbers, etc.)	3.33	10.00	.07	.17	4.61	10.87	8.04	20.19
23. Flying objects	....	....	....	....	6.60	15.58	11.52	28.94
24. Handling rock by hand	....	....	....	....	2.59	6.11	4.52	11.35
25. Burns	3.33	10.00	.07	.17	2.43	5.73	4.24	10.64
26. Other causes	5.00	15.00	.10	.25	8.50	10.06	14.84	37.27
Total	33.33	100.00	.67	1.68	42.39	100.00	73.99	185.79
Grand total	100.00	....	2.00	....	100.00	....	174.54	....

Falls or slides of rock or overburden caused the third largest number of accidents among men working in the quarries; they resulted in 20 deaths and 620 injuries, or 17.74 accidents per thousand 300 day workers, as compared with 14.80 per thousand employees in the previous year. The number of accidents from falls of quarry material was exceeded by the number resulting from handling rock at face and from flying objects, the accident rates for which were 31.84 and 25.83, respectively, per thousand men employed inside the quarries.

Among the hazards to which the quarry workers were exposed in 1921, the use of explosives ranked second in the number of resulting fatalities and tenth in the number of nonfatal injuries, thus indicating the large proportion of fatal accidents from this cause. Out of 215 accidents from explosives, 17 were fatal and 198 nonfatal, the accident rate being 5.96 per thousand em-

ployees (300-day basis) as compared with 5.48 per thousand in 1920. Most of the accidents from explosives resulted from premature shots, striking in loose rock, charging, and drilling into old holes.

Haulage accidents in 1921 resulted in 12 deaths and 554 injuries to men in the quarries and 5 deaths and 296 injuries to men employed at outside works. For the men in the pits the accident rate was 15.68 per thousand employees (300-day workers) as compared with 18.02 in the preceding year; for the men at the outside plants the rate was 12.61 as against 14.62 in 1920. These figures, Table 19, indicate that in 1921 haulage accidents ranked fourth as a cause of accidents to quarry employees and sixth to employes at outside works.

Accidents caused by machinery resulted in 8 deaths and 550 injuries to men employed inside the quarries, and 10 deaths, and 578 injuries to men at crushers and rock-dressing plants outside the quarries. Machinery thus ranked fifth as a cause of accidents inside the pits and second as a cause of accidents at outide plants. Inside the pits the accident rate, including fatal and non-fatal injuries, was 15.46 per thousand men employed (300-day workers); at the outside plants the rate was 24.63. For the preceding year these rates were 11.46 and 22.98, respectively.

The hazards to which quarrymen are exposed are not the same for all kinds of quarries. Much depends on whether the stone is being produced for structural purposes, or whether it is to be crushed and used as a flux, or for making lime, or for road building. If the stone is to be used for monumental or structural purposes, much care in quarrying and handling must be exercised to prevent breakage, and a minimum amount of explosives used. On the other hand, if the stone is to be crushed, large quantities of explosives may be used and no care to prevent breakage in handling and hauling need be exercised.

These facts indicate that accidents from falling quarry material, from handling rock, and from explosives should be more frequent at crushed-stone quarries than at building-stone quarries. This conclusion is proved by Table 27, which covers accidents at these two classes of quarries during the past five years, based on reports from operating companies. The table shows the relative frequency of accidents from different causes, based upon the number of men employed (calculated upon a standard of 300 work days per year). The injury rates from accidents that may be attributed to the lack of need to prevent breakage of stone, are consistently higher at the crushed-stone quarries.

The Limestone Quarries Company, of Delphos, Ohio, is preparing to open up a new quarry not far from the site of the present plant. This new plant will have a very much greater capacity than the one which is now being operated by the company, and which will continue in operation until the new plant is in readiness.

The Pittsburgh & Zanesville Mining Co., have purchased 2,200 acres of land on the west side of the Muskingum River near Zanesville. The new are planning to develop the coal, sand and clay deposits which are abundant in this section. The sand lies over the coal and the clay under the coal, and mining will be by stripping and deep mine methods. The investment will reach in the neighborhood of $600,000. The chief promoters in this enterprise are, R. C. Burton and C. E. Corbin of Zanesville, J. M. McNeill of Pittsburgh, and the Blanchard Coal Co., of Pittsburgh.

A. W. Berghoefer, intimately known to the coal and ice trade, has again become associated with the Gifford-Wood Co., of Hudson, N. Y., and will be located at the company's New York office at 50 Church St.

Mr. David Augustus Decrow, who died February 15th, became associated with the Holly Mfg. Co., in the early '80s. During his association with that company he became known as a water-works engineer of national prominence and continued his work in that line until the time of his death. Some years ago the Holly Mfg. Co., was combined with the Snow Steam Pump Works which was later succeded by the Worthington Pump and Machinery Corp. Mr. Decrow remained with what was to all intents and purposes the same organization from the time he began his professional work until the close of his career. He was buried in Lockport, N. Y., and is survived by a wife and two sons.

Two Big Agstone Days

Work in Ohio and Pennsylvania Stimulated as Result

At Cleveland, Ohio, March 5, and at Harrisburg, Pa., March 6, the National Agstone Association put in two days of intensive and resultful endeavor.

President E. M. Lamkins stated that a discussion of three projects were the objects of the Cleveland meeting.

1. Founding and financing an agstone fellowship at Ohio State University.
2. Establishing a research and review service.
3. The financing of an advertising program.

Prof. Firman E. Bear, chief of the Soils Department at Ohio State University, presented in detail the work the Ohio College had done, is doing, and expects to do in teaching the need of agstone on Ohio farms. Prof. Bear called attention to an editorial in Breeders Gazette, issue of March 1, 1923; and a story in the Country Gentleman, issue of March 3, 1923, in which doubt is expressed as to whether or not the soil needs limestone to encourage the growth of cer tain plants. These articles are not in harmony with the teachings of soil experts, he said. They are disputed by experience and experiment.

Prof. Bear made an earnest appeal for an agstone fellowship at Ohio State University. Discussions and questions followed his address. April 1, 1923, was deemed an opportune time to start the fellowship work, if a suitable man could be found satisfactory to Prof. Bear, the Agricultural College, the Board of Trustees of O. S. U., and the National Agstone Association. The young man accepting this fellowship is to devote his entire time to this work, with one month vacation each year. This fellowship student to make reports at end of the year when same is approved and released by Prof. Bear, or his Soils Department. Prof. Bear further advised the donors of this fellowship not to expect immediate results, as this fellowship would be to establish basic facts on which the State University could base the compilation of future bulletins and its program of teaching the needs and the results of using limestone, and thereby assist the agstone industry in promoting the sale and use of agstone in the best way to do the most good for the farm.

Mr. J. C. King moved and Mr. A Acton Hall supported a motion that the National Agstone Association finance an agstone fellowship at Ohio State University for a period of 5 years at $2,000 per year, and this sum be paid in quarterly installments by the following Ohio agstone producers:

Ohio Marble Company, Piqua,
Carbon Limestone Co., Youngstown.
Bessemer Limestone Co., Youngstown.
Kelley Island Lime & Transport Co., Cleveland.
France Stone Company, Toledo.
Colgan Limestone Products Co., Columbus.
Marble Cliff Quarries Co., Columbus.

Agreement was reached that the results of this agstone fellowship in Ohio State University at a total cost of $10,000, subscribed by Ohio Agstone producers, should be used to benefit and promote the interests of all members of the association.

In the matter of a research and review service, agreed to at Chicago meeting, January 18, 1923, Mr. Hall moved and Mr. King supported a motion that A. P. Sandles, secretary, and Harry Brandon proceed to arrange with Prof. Bear of Ohio State University to secure the services of some person to assemble bulletins, reports, literature and data published or issued by agricultural colleges, experiment stations, soils departments, farm papers, trade journals, etc., having a bearing upon the agstone industry; that such employed person shall review all such literature and reports and assemble same in the form of a clipping service and research comments and furnish same to all members of the National Agstone Association to assist them in promoting the use and sale of agstone, and not more than $1,000 per year be spent in research and review service. The motion was agreed to.

A motion was approved to appropriate $5,000 for a general advertising campaign in Ohio and that said sum be paid by Ohio Agstone producers on the basis of their 1922 tonnage output.

The secretary presented applications for memberships as follows:

New Castle Lime & Stone Company, New Castle, Pa.
Limestone Products Corp. of America, Newton, N. J.
E. J. Lavino & Company, Philadelphia, Pa.
Kittanning Limestone Company, Kittanning, Pa.

The secretary presented the fi-

nancial report of the secretary and treasurer which showed all membership dues paid, no bills unpaid and money in the bank.

At Penn Harris Hotel, Harrisburg, Tuesday, March 6, the Pennsylvania-Eastern group meeting was called to order. J. C. King, chairman of the board of directors, presided. The following persons were present during the day:

Governor Gifford Pinchot.
President Thomas of State College.
W. C. Byers, Agricultural Bureau Director of Pennsylvania State Chamber of Commerce.
Mr. Willits, Pennsylvania State Secretary of Agriculture.
Prof. Hitshman, State College, Penn.
Prof. J. W. White, State College.
E. B. Reinhold, Reinhold-Owens Co., Pittsburgh (and two brothers)
K. C. Styers, Grove City Limestone Co., Grove City, Pa.
R. W. Stone, Asst. State Geologist, Penn. Geological Survey.
S. S. Scholl, E. I. Du Pont de Nemours & Co., Pittsburgh, Pa.
Wm. D. Kochersperger, Limestone Products Co., Mifflinsburg, Pa.
A. Action Hall, The Ohio Marble Co., Piqua, Ohio.
H. H. Brandon, The Ohio Marble Co., Piqua, Ohio.
W. S. Rupp, The Baugh & Sons Co., Baltimore, Md.
Ellwood Gilbert, New Castle Lime & Stone Co., New Castle, Pa.
Glenn H. Campbell, National Stockman & Farmer, Pittsburgh, Pa.
E. R. Walker, Pennsylvania Farmer, Philadelphia, Pa.
Fred J. Streeter, Michigan Limestone & Chemical Co., Buffalo, N. Y.
Edgar M. Lamkin, Kelley Island Lime & Transport Co., Cleveland, O.
Edw. S. Bixler, Limestone Products Corp. of America, Newton, N. J.
R. S. Newman, Ohio Farmer, Cleveland, Ohio.
J. C. King, Carbon Limestone Co., Youngstown, Ohio.
F. W. Cramer, York Valley Lime & Stone Co., York, Pa.
John B. Fox, West Branch Lime Co., Williamsport, Pa.
A. P. Sandles, Secretary, Nat'l Agstone Ass'n., Columbus, Ohio.

Chairman King stated that at suggestion of the Pennsylvania agstone producers this meeting was being held to discuss a general advertising campaign in Pennsylvania and also to discuss a $100,000 memorial building at Pennsylvania State College in memory of the late Dr. Freer.

Chairman King introduced Prof. J. W. White who made an appeal for funds for this building. Prof. White said the first use of agricultural lime of record was in Lancaster County, Pennsylvania, and his state had nearly one-fourth of all the limestone in the United States. Chairman King stated that he was in thorough sympathy with Prof. White's splendid address and that agstone producers would personally contribute, but being a national association with members in many states he doubted the wisdom of the association voting funds for this project.

Agstone producers broke bread with distinguished citizens of the Keystone state. Governor Pinchot is one of the foremost Americans in the public eye today. Dr. Thomas as president of the Pennsylvania State College is a noted educator. His chief soil expert, Prof. J. W. White, is known throughout the country. The Pennsylvania secretary of agriculture, Mr. Willits, is a dirt farmer and the champion mushroom grower of the nation. His annual production is near 50 tons, which he markets at a price of $500 to $600 a ton. Director Byers of Pennsylvania State Chamber of Commerce, has had experience as agricultural agent of the New York Central Lines, and is now boosting agricultural limestone and lime. These men were guests. Lieut.-Governor David A. Davis came to the hotel and expressed regret that pressing official duties would prevent his presence.

A. P. Sandles introduced Governor Pinchot and other luncheon speakers. This mid-day meeting was a feast of good fellowship.

At the afternoon session, decision was made to start an advertising campaign, and the following firms expressed a willingness to subscribe:

Carbon Limestone Co., Ohio....	$ 500.00
Limestone Products Corp. N. J..	250.00
Michigan Limestone & Chemical Co., N. Y.....	500.00
York Valley Lime & Stone Co., Pa.	100.00
New Castle Lime & Stone Co., Pa.	100.00
Grove City Limestone Co., Pa..	100.00
Limestone Products Co., Pa...	50.00
	$1,700.00

Pennsylvania producers agreed to hold another meeting, Tuesday, April 3. 1923, at Harrisburg, to further discuss this advertising campaign. Each producer present agreed to vigorously urge all Pennsylvania agstone producers to attend this April meeting and secure the additional $1,300 to pay for the $3,000 advertising campign to promote the use and sale of agstone in the state of Pennsylvania. Mr. P. B. Reinhold was made temporary chairman of Pennsylvania group for the April meeting.

Kentucky Road Work

Kentucky has been smarting a little under the stigma of reports among motorists that it is a good state to detour because of the incompleted and disconnected condition of the highway. This is arousing a little extra effort along good road lines and it is developing a strong plea to have the legislature submit to the people a fifty million dollar bond issue proposition which failed of passage at the last session. H. Green Garrett, of Winchester, Highway Commissioner of Kentucky, who is a man of aggressive business methods as well as broad vision, has been making a very earnest plea for this bond issue and has prepared figures demonstrationg how it can be taken care of without any increased burden of taxation.

Recently a special committee of the Board of Trade of Louisville, which has been making a study of this question, made a very elaborate and favorable report practically coinciding in detail with the arguments advanced by Commissioner Garrett.

This committee in its report says that in 1922 Kentucky had available for road purposes $3,425,000 derived from the following sources of taxation:

Gasoline taxes	$ 587,000
Automobile	2,138,000
Three cent tax	700,000

It estimates, too, that the income from these sources for 1923 will be approximately $3,800,000.

There is then a review of the money spent and the work done during 1922, followed by a tabulation of bond issues by neighboring states, and the report winds up with the following recommendations:

First—That the question of a $50,000,000 bond issue should be submitted by the Legislature to a vote of the people who alone can decide it.

Second—That Kentucky's Road System shall be at all times under the control of a bipartisan commission to be appointed by the Governor with the approval of the Senate and that the two candidates for the Governorship when nominated and before the election, will lay aside political differences, agree upon and announce the personnel of said Commission to be named by them in the event the bonds are voted.

Third—Legislation restricting the weight and type of vehicles permitted to make use of the roads constructed and maintained with public funds.

From this it will be seen that the Kentuckians have been stirred up by reports of backwardness in their road construction and the present indications are that not only will there be a hard drive for a bond issue to carry on in the future, but there will be an energetic pushing of road work this year with whatever funds are available, and there promises to be enough of this to make active times in the development of quarrying and crusher work and in road construction contracts.

Investigation of Mineral Fillers

In the investigation of non-metallic minerals in order to determine their use as mineral fillers, being conducted at the Southern experiment station of the Bureau of Mines, Tuscaloosa, Ala., a special study is being made of the determination of the grain size and character of grains of representative fillers produced in the district. The investigation includes a study of the various methods of calculation of average grain size of mixed products, the development of a method of measurement of grain size applicable to fillers in which there is a great range in size, varying from diameters of 100 microns or more to zero, and the determination of average grain size of representative samples of commercial fillers including clay, barite, fuller's earth, whiting, mica, ocher, slate, silica and talc. The character and size of particle of fillers is a basic property that has an important effect on the other physical properties and characteristics and a knowledge of it is important in the application of fillers to different uses.

The effect of grain size of fillers in compounding is also being studied by the bureau. This investigation will especially be conducted along the line of determining the difference in actual use between a filler made up of mixed sized grains as usually employed, and the same material but classified within as close limits as possible as regards variation in grain size, but having the same average diameters as the mixed product. It will also include the determination of the difference in effect between two products of the same material, but classified be-

tween different limits of grain size.

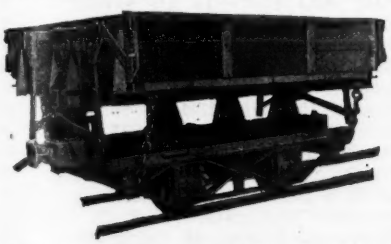
The effect of heat treatment on the properties of non-metallic minerals other than clays with respect to their use as fillers is also being studied by the Bureau of Mines. This will involve a determination of the effect of heating at different temperatures on the specific gravity, loss in weight, color, grain size, oil absorption, covering power or spread and ease of grinding. Previous work on clays along the same line has shown an improvement of certain samples for filler use.

The relationship between grain size, oil absorption and covering power of fillers and pigments is also being studied. The general direction of this relationship is known but no exact data are available on the subject. Also for two different minerals of same size, the relationship varies and a mineralogical coefficient will be sought. In addition, the effect of products classified as to size will be studied.

Square Box Dump Cars

Something new in the line of square box dump cars, produced by the Koppel Industrial Car & Equipment Company of Koppel, Pa., is shown in these illustrations.

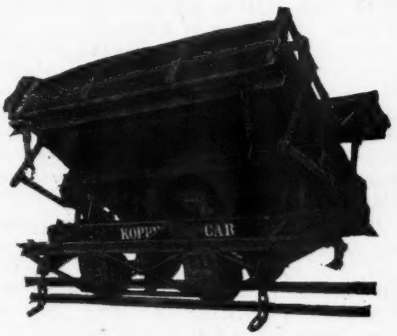
To meet the demands for heavy, substantial equipment, the Koppel Company have designed a car known as the "hinged" type, the body of which is permanently hinged to the underframe. It is noted for its sub-



stantial door construction; its large door opening which enables the car to dispose of large bowlders, eliminating the danger of such obstacles becoming wedged between the door and floor; pressed steel diaphragms in the underframe, also for its great flexibility, this car being equipped with double spring suspended bearings.

The doors and ends are constructed of 1¼ inch oak, stiffened and protected by steel angles; the door top angle is trussed at center insuring a strong edge at top of door which will withstand accidental steam shovel blows. The door opening of this car is very large and the dumping angle steep, affording clear discharge of contents. Doors are operated by Koppel patented toggle arrangement.

The floor is made of 2⅜ inch oak, mounted on a rigid steel frame con-



sisting of center and side sills made of channel and rolled angles. Heavy tee sections are riveted to these sills forming a rigid unit to which the floor is bolted. The body is provided with four cast steel hinges securely riveted between center sills, thus permanently fastening the body to the frame of car.

The underframe of the car is composed of center and side sills made of channel and rolled angles. These sills are mounted on heavy steel bolsters braced by arch bars. A distinct feature of the Koppel car is the framework of pressed steel diaphragms between the center and side sills and bolsters.

Chilled iron wheels on 4 inch steel axles form the running gear. The journal boxes are semi-steel; the boxes with lead lined brass bearings are suspended in two well dimensioned helical springs, this arrangement insuring great flexibility to the car when traveling over rough roadways. The cars are equipped with spring draft gear, having link and pin couplers.

Mr. Fred Braun, of Algoma, Wis., has plans under way for establishing a limestone crushing plant at that city. The limestone rock will be taken from the shores of Lake Michigan and from Kewaunee and Door counties.

For Heavy Production

Spring Business Looms Big in The East

By Our Eastern Correspondent

Spring business looms big with the sand and gravel producers in the New York and eastern districts, and there is every indication of a record-breaking season in the industry. Heavy production is planned at the different plants in this locality and preparations are now being made for continuous operations for months to come; sand and gravel pits are being made ready for working, with necessary repairs and replacements in equipment.

The labor situation gives the greatest concern at the moment, and good men are extremely difficult to obtain. All sorts of inducements are being offered in recruiting working forces, even beyond the quite well established wage scales of 30 to 50 cents an hour, as now prevailing in this section. Every industry which requires common labor has drawn heavily on the supply, and the seasonal or near-seasonal activity is handicapped as compared with the branch of trade offering continuous employment.

With the construction industry moving along at top pace, building supply dealers are ordering and stocking up with sand, gravel, cement and other basic commodities, and if evidence was needed of forthcoming scope of activities, it could be found readily in the sizable business being placed. Road operations are also of encouraging status, and large quantities of cement, broken stone and affiliated materials will find their way in this phase of construction during 1923.

Prices are very firm, with strong tendency towards higher levels as spring trade reaches its peak. Recent advances in western cities in the line of cement and other stocks are reflected in the tone of the New York market. There is a disposition on the part of producers and dealers to resist increased schedules just as long as possible.

Good washed gravel maintains a $2.00 level in carload lots, both 1½ and ¾-inch sizes, and since the advent of more spring-like weather, there has been a noticeable increase in distribution. Dealers are asking $2.75 a cubic yard for the material, delivered on the job.

The best grade sand continues at $1.00 a cubic yard in wholesale quantities to dealers and contractors. The immediate supply is sufficient for all demands and with quite heavy shipments due from the Cow Bay district, the situation is well in hand. Dealers price the material at $2.00 a cubic yard, delivered. Sharp white sand holds at $4.50 a cubic yard in retail lots.

There is no change in price levels in the broken stone market; 1½-inch stock is selling for $1.65 a cubic yard in cargo shipments, f. o. b. city, while smaller sizes, ¾-inch graded, stands at a level of $1.75. The New York and neighboring supply yards list the material at $4.00 a cubic yard, both sizes, delivered in nearby zones.

Early spring quotations on Portland cement in the eastern district show no variation, despite the fact that a number of the western mills have advanced the base. The Lehigh Valley section, however, one of the main sources of supply for New York and vicinity, is holding to the established level. At New York, alongside dock, $2.30 is the barrel quotation, while delivered by motor truck to dealer or contractor, an advance to $2.60-$2.70 is asked. A year ago, the base was 30 cents a barrel under these figures. The established price at the supply yards is $3.20 a barrel, delivered on the job,. with regular bag rebate of 10 cents.

Lime is operating under an active call, and there is an appearance of higher levels in current quotations. Hydrated material is from $16.85 to $17.10 a ton, wholesale at the warehouse, finishing stock; common hydrated lime is $13.10 a ton. Regular lump lime is selling for $3.75 a barrel in large quantities, while common lump material is priced at $3.10 to $3.25 a barrel in wholesale lots, warehouse. The latter stock in standard 300-pound barrel is being turned by dealers at a level of $3.75, while finishing material, same sized container, is $4.50, an advance of 50 cents over the figure of a month ago. Hydrated finishing lime, in paper bags, is available at the supply yards at $24.00 a ton, delivered, while hydrated common, paper bags, is $19.50, ton price.

The Bridgeport Sand & Gravel Co., Bridgeport, Conn., has been organized with a capital of $20,000, to operate local sand and gravel properties. Ex-

tensive production is planned. The company is headed by Alfred Grasso and Samuel Zimmer, 217 Laurel Avenue, Bridgeport.

The Westerly Blue & Light Granite Co., Milford, Mass., has been formed with a nominal capital of $6,000, to operate quarries in this section. James J. Murphy is president; and Antonio Monti, Milford, treasurer. The last noted represents the company.

The Mineral Potash Corporation, care of J. P. Andrews & Co., 514 Brisbane Building, Buffalo, is perfecting plans for the installation of quarrying machinery, crushing and grinding equipment, air compressors, pumps and other machinery at feldspar properties in this section. A fund of $300,000 is being arranged for the entire development.

The Buffalo-Indiana Stone Corporation, Buffalo, N. Y., has been organized with a capital of $20,000, to operate a crushed stone producing plant. The incorporators are R. H. Tifft, J. E. Johnson and E. L. H. Nash. The company is represented by G. W. Wheeler, Brisbane Building, Buffalo.

G. W. Maltby & Sons Co., Buffalo, operating a stone yard at 21 Maryland Street, will commence the immediate erection of a new plant addition, estimated to cost $5,500, exclusive of equipment.

With the commencement of the spring season, sand dredging operations have been resumed in the vicinity of Bordentown and White Hill, N. J., and a heavy production schedule is being arranged. The first company to commence work in this district for 1923 output, is the Philadelphia Transportation & Lighterage Co., 119 Walnut Street, Philadelphia, Pa., and it is planned to operate continuously throughout the months to come. Other dredges are also starting up, after a suspension since last December, and the scarcity of good river sand in past weeks in the Philadelphia market will now be a thing of the past. About 400,000 tons, gross, are reclaimed in the Delaware River annually.

The Newton Slate Corporation, Newton, N. J., has been formed under state laws with a capital of $300,000, to operate quarries in this vicinity. Plans are being perfected for extensive development. The company is represented by the New Jersey Registration & Trust Co., 525 Main Street, East Orange, N. J.

Stone quarries in the vicinity of Altoona, Pa., are advancing production and an effort is being made to secure additional men. The labor situation is not of the best, and there is a keen demand for good operatives. Throughout Blair County practically the same condition exists; the quarries are running as close to 100 per cent as possible, while limestone works are on a like schedule, reflecting the marked activity in the steel industry. The limestone quarries form one of the primary lines of industry in this county.

The Chapman Slate Co., Bethlehem, Pa., is arranging for extensive operations at its quarries and has been stripping and uncovering with the use of a 70-ton steam shovel, probably the largest ever used in a slate quarry in the state. About 40,000 yards of stripping have been removed from some of the finest properties of the company. The company has tentative plans under consideration for the electrification of its properties, and will soon commence the installation of electric equipment for this purpose, including motors, transformers, controllers and other apparatus. It is expected to have the improvement completed in the summer or early in the fall.

The Emigsville Lime & Shale Co., Emigsville, near York, Pa., has tentative plans under consideration for the early rebuilding of the portion of its plant, destroyed by fire, March 8. Considerable equipment was damaged, including three large kilns.

The Washington Slate Co., Slatington, Pa., is planning for early resumption of production at its local quarries and machinery will be made ready for service at an early date. The company is said to have a number of large orders on hand.

There is a marked scarcity of labor for quarry service in Eastern Pennsylvania, and a number of the plants are giving considerable attention to the problem of securing full working forces for spring and summer operations. The situation is bringing about a condition of bidding for men and wages are due for an advance.

The John E. Baker Stone Co., Saginaw, near Mount Wolf, Pa., is maintaining regular production at its plant and plans to continue under a heavy production schedule for some time to come. A full working quota is being employed and large shipments are leaving the plant.

Every Prospect Pleases

Cement Plants on the Way to a Big Year of Production

Practically every mill in the Lehigh Valley section of Pennsylvania is on the producing list, looking forward to one of the greatest periods of activity ever experienced in the industry. The demand for cement shows no abatement; on the contrary, with spring business opening both in the building construction field and road-building line, there is a noticeable increase in immediate call, necessitating a large tonnage output, as well as call on the fair-sized reserves that the mills have been able to accumulate during the past few weeks.

Anticipating the demand for power that will be made by the mills in this section in early weeks to come, public utility companies have been active since the first of the year in building new transmission and distributing lines in this territory. The contracts made for power show the urgent necessity for this expansion. The Lehigh Navigation Electric Co. has a high-tension line in course of construction from Laury's to Egypt, and will supply a number of mills at the latter point; this is an interest of the Pennsylvania Power & Light Co.

The majority of the cement plants have now completed necessary machinery repairs and improvements necessary for the spring run, and immediate consideration is being given to essential working forces for desired capacity. Labor in this section, similar to other parts, is not only scarce, but growing scarcer; with the steel mills running full, and offering sizeable wage schedules for common labor, the men have easily found jobs, leaving a number of the cement plants in sore need for larger working forces, even though equal wages are being given. It is likely that labor from other sections will have to be imported into this district in a short time. The rail situation shows marked improvement and with the gradual lessening of the need for cars for coal, greater supply will be available for transportation of cement from the mills.

The Atlas Portland Cement Co., Northampton, Pa., has advanced production to practically a capacity basis at its local plants. Mill No. 3 has recently been placed in line with an output of 10,000 barrels a day. The company gives employment to about 6,000 operatives at its different plants. Shipments are heavy and there is a noticeable improvement in export orders. Considerable production from the local plants is finding its way to the latter outlet. The neighboring mills of the company at Coplay are on the active list, giving employment to all available workers. The Atlas mills at Hudson, N. Y., Hannibal, Mo.; and Leeds, Ala., are all busy.

Harry J. Seaman, general manager for many years of the Atlas Portland Cement Co., at Northampton, Pa., died recently at his residence at Ventnor, N. J., aged 65 years. He was widely known and very popular in the cement industry. In 1892, Mr. Seaman became superintendent of the Atlas company, then in process of formation. Later he was made general manager of the Northampton works, and continued in this capacity. He was largely instrumental in perfecting the rotary process of Portland cement manufacture, and invented and commercialized a process of burning pulverized fuel, now used extensively in the industry. At the time of his death, Mr. Seaman was also vice-president and general manager of the New York & New England Cement & Lime Co.

The Coplay Cement Co., Coplay, has Mills B and C in active service, giving employment to a large working force. The first noted plant, B, resumed production early in March, following a brief curtailment for necessary repairs and improvements. Mill C has been operating steadily since January, when repairs were made here. It is expected to continue on the present capacity schedule for many months to come. Plans are under consideration for the erection of a housing development for employes on the site of the local baseball grounds. It is expected to build a first unit of 19 homes.

The Nazareth Cement Co., Nazareth, is running full at its local mill, with regular working quota, and is said to have sufficient orders on hand to insure production on the present schedule until well into the fall season. Heavy shipments of cement are leaving the works for Philadelphia, New Jersey and other eastern destinations.

The Alpha Portland Cement Co., Easton, Pa., is perfecting plans for improvements and extensions in its plant at Martin's Creek, Pa., for

greater efficiency and economy in operation. A new power house will be constructed and a waste heat system installed. The latter will utilize the waste heat from the large kilns to operate a 4,800 horsepower boiler. The electric plant will include a 6,250-kilowatt generator, with auxiliary operating machinery. It is said the company's decision to install its own power plant has been brought about on account of the high rates for service now being charged by the central station, which power, heretofore, has been used. The company is arranging an appropriation of more than $1,200,000, for extensions and improvements in its plants in different parts of the country, to include the installation of considerable new equipment for more economic operation.

The Lehigh Portland Cement Co., Allentown, Pa., is maintaining operations under normal capacity at its various plants in the Lehigh Valley section. During the year just passed, the company attained the highest production in its history, totalling nearly 18,000,000 barrels. This output, incidently, represents approximately one-eighth of the total cement production of the company. It is planned to have the new mill now in course of erection at Birmingham, Ala., ready for service at an early date, and the different units will be started up as soon as the machinery has been placed and tried out. This will make the sixteenth Lehigh mill in the United States. The company has recently increased its capital from $18,000,000 to $25,000,000, for general expansion and additional working capital. General Harry O. Trexler is founder and president of the company.

The Lawrence Portland Cement Co., Northampton, Pa., has advanced production to maximum at its plants in this section, including the Siegfried properties, and expects to continue under full blast for some time to come. Improvements and repairs have been made in machinery, and the mills are said to be in fine shape. The company recently gave an annual dinner at the Hotel Allen, Allentown, to superintendents, heads of departments and office employes, and it proved to be one of the most successful affairs yet held. It was followed by a theatre party at a local playhouse. This was the twenty-third event of its kind and a prominent feature in the annual inner-office activities of the organization. F. H. Smith, president of the company was among those assembled. The affair was in charge of C. A. Porter, third vice-president of the company.

The mill base in the Lehigh Valley section holds at $2.10 a barrel, and there is no indication of any immediate change. Spring call may cause a tendency towards higher levels, but it confidently hoped that the present figure can be retained with profit to the plants. At Hudson, N. Y., a figure of $2.20 maintains, while a similar figure is being quoted by the Atlas company at Leeds, Ala.; La Salle, Ill., mills are furnishing material for $2.05 at the plant, and Hannibal, Mo., figures stand at $2.10. There has been advanced to $2.00 a barrel at Universal, Pa., where the price recently declined to $1.90. Other increases have been made during the past month at Buffington, Ind., to $1.95; Steelton, Minn., to $1.95; and Mason City, Ia., $2.05.

The International Cement Corporation, Kansas City, Mo., has plans nearing completion for extensions and improvements in the former plant of the Bonner Portland Cement Co., Bonner Springs, Kan., recently acquired. The work will include the erection of new buildings and the installation of considerable machinery and operating equipment, and is estimated to cost close to $1,000,000. The company is operating full at its different mills, and is said to be arranging for an unusually heavy spring production.

Cement mills in the vicinity of Kansas City, Mo., are now operating at 20 per cent greater capacity than at any time during the past year, and finding an immediate outlet for all manufactured material. It is expected that spring production will be maintained rigidly at the present figures, if not at advanced outputs. There is a heavy call from building supply companies throughout this territory, who, on the other hand, are being pressed for immediate deliveries.

William Evans, Bethlehem, Pa., and William T. Peters, Allentown, Pa., have purchased the quarries of the Imperial Slate Co., Wind Gap, Pa., from Norman B. Dreher, trustee for the stockholders. The new owners plan for the early operation of the property, and will install necessary machinery and equipment for this purpose. It is expected to give employment to a large working force.

Busy Filling Orders

Texas Producers Disposing of Capacity Output

By Our Dallas Correspondent

Sand and gravel dealers in Dallas, Texas, and vicinity report unusually good business, and with the coming of spring, material increase in the demand for these building materials is noted. Building operations in Dallas, Fort Worth, Houston and other Texas cities are unusually active at this time, and road construction and street paving are being done on a large scale. Sand and gravel in large quantities are being used and dealers and operators of gravel pits are being hard pressed to fill orders.

In Dallas the Medical Arts Building, an eighteen story poured concrete structure, has recently been completed. The Dallas Athletic Club 22-story building is to be started immediately, and several other buildings from eight stories to 20 stories are to be erected this summer. All these have created a big demand for gravel for building purposes in Dallas.

Most of the gravel for the Medical Arts Building was furnished by the Eagle Ford Gravel Company from its pits near Dallas and was washed and screened before using. This company was one of the first to equip its plant for washing gravel.

The J. Fred Smith Gravel Company, organized in 1912, however, has also installed gravel washing and screening equipment and is now able to deliver 15 carloads of washed gravel and 15 carloads of washed sand a day without working overtime.

The J. Fred Smith Gravel Company is one of the largest dealers in gravel in Dallas, and operates several large pits along the Trinity river. This company in a recent report showed that it had produced more than two and a half million cubic yards of material since it began operation in 1912, including 750,000 cubic yards road gravel, 1,000,000 cubic yards of railroad ballast and nearly 1,000,000 cubic yards of gravel for concrete construction, which has gone into some of the largest and most notable works of this section.

This company is now keeping all its equipment in its three pits busy all the time and reports orders booked ahead. For a time this company was hampered in its operation on account of lack of cars, but for some months shipping facilities have been adequate.

The Olem Gravel Company, Vilbig Bros., Trinity Gravel Company, Hunter Ferrell and other companies in Dallas report that they are operating on full time and can keep up with orders with the greatest difficulty.

The Court of Dallas and City of Dallas, which operate their own gravel pits, are working to capacity. Both city and county are doing considerable paving of streets and highways, and gravel is being used in large quantities.

Griffin & Wooten, contractors, have opened large gravel pits in Howard County, near Big Spring, from which they are taking large quantities of gravel for road construction in Howard, Ector, Martin and Midland counties along the Bankhead Highway. The Texas & Pacific built a spur track of about one mile in length extending to the gravel pits just east of Big Spring. This firm has contract for graveling the 99 mile stretch of highway in the counties named, and the Texas & Pacific is hauling the gravel. Side tracks are placed on the main line at five mile intervals and gravel is being hauled from these switch points 2½ miles in either direction and distributed along the highway.

Gravel in Dallas is selling for $1.50 to $2.00 f.o.b. pits, and prices delivered on the job in Dallas range from $2.50 to $4.50, depending on difficulties encountered in making deliveries. Delivery by motor truck has been made somewhat difficult for the last three weeks on account of continued rainfall, and wagons and teams have been resorted to. Fair weather seems likely for the next few days, however, and activity in the truck deliveries is increasing.

A recent contract awarded at Orange, Texas, covering gravel for highway construction shows the range of prices in that section. The Evangeline Gravel Company of Vinton, La., offered 5,000 cubic yards of washed gravel at $2.37 per cubic yard, f.o.b. shipping point, while the Gulf Gravel Company was low bidder on 10,000 cubic yards of pit run sand-clay gravel at $1.70 per cubic yard f.o.b. cars at pits. This gravel is to be used in building the highway from Orange to Vinton, La.

Several new companies to deal in sand, gravel and crushed stone have been organized in Texas recently, showing the increasing business in these materials.

The Incorporated Gravel Company of Dallas has been organized with a capital stock of $2,100. Incorporators are: E. B. Cantrell, A. E. Doss and A. N. Gorenbreth, all of Dallas.

The Harston Sand and Gravel Company has been organized with a capital stock of $120,000 to operate gravel pits and deal extensively in sand and gravel. Incorporators of the company are: Dan S. Harston, W. E. Callahan, J. H. Smith and others.

The Urbana Gravel Company of Urbana, San Jacinto County, Texas, has filed an amendment to its charter enabling it to enlarge its business. The name was changed to the Urbana Sand and Gravel Company, to permit operations in sand as well as gravel, and the capital stock was increased from $30,000 to $50,000.

The Texas Cement Plaster Company of Hamlin, Texas, filed an amendment to its charter increasing the capital stock from $64,000 to $512,000.

Stockholders of the Southern Stone and Marble Company of Yoakum, Texas, held their annual election, at which the following officers for the company were chosen: Philip Welhausen, president; William Green, first vice president; W. L. Burton, second vice president; C. L. Moore, general manager, and E. C. Koerth, secretary.

The Rockford Sand and Gravel Co., 1132 N. Court St., Rockford, Illinois has been incorporated with a capital of 200 shares of no par value. The incorporators are Rea Hurt, Fred H. Carrice, S. A. Gibson. Correspondents: Passett, Abbott and Hughes, 1st Natl. Bank Bldg., Rockford.

The Wisconsin Sand and Gravel Company, Milwaukee, Wisconsin, was declared solvent by Circuit Judge Lawrence W. Halsey, who set aside the order he made on January 22nd, providing for appointment of a receiver for this company. It was shown before the court that the company is not insolvent and that under the present management is able to continue in business. The company was incorporated in 1915 and is capitalized at $90,000. According to a report made in 1921 its assets were $174,499.

Of Course Lime Pays

North Carolina Has Proved It Again in Five Year Rotation

Excellent results have been secured in a test made with ground limestone in a five-year crop rotation on the red clay loam soils of the Piedmont Branch Station farm near Statesville, N. C., reports E. C. Blair, extension agronomist for the State College and Department of Agriculture. Mr. Blair has recently secured the results of a test conducted by W. F. Pate, soil agronomist for the Agricultural Experiment Station. Mr. Pate applied two tons of ground limestone per acre in the spring during the first year of the rotation.

The land was then placed to corn and the limed area produced 43 bushels per acre while the unlimed area produced only 35.5 bushels. This difference of 7.5 was not much for the first year. The second year, the land was in wheat. The limed area produced 14.1 bushels, while the unlimed produced 11.4, a difference of only 2.7 bushels.

Not much effect shown yet—but here is the third year, when red clover was on the land. The first crop was turned under and this was the second crop to be cut and used for hay. The limed area produced 3,104 pounds of hay, while the unlimed area produced only 829 pounds and most of this was weeds. This is a difference of 2,275 pounds of hay from lime applied three years before.

The fourth year the limed area produced 1,350 pounds of seed cotton and the unlimed produced 1,302 pounds, and the fifth year the limed area produced 50.2 bushels of corn while the unlimed area produced only 38.6 bushels. This was an increase of 11.6 bushels as compared to the increase of 7.5 bushels secured the first year the lime was applied.

Mr. Blair states that this experiment shows beyond all doubt the beneficial effects to be secured from the proper use of limestone, especially in the growth of legumes and the resulting effect on the crops that follow.

The Lake Shore Sand Company of Chicago has increased its stock from $20,000 to $200,000.

Winter Was Eventful

Its Mildness Encouraged Much Building in Cincinnati District

By Our Cincinnati Correspondent

The past winter, unusually mild and conducive to winter building, has proven an eventful period for the sand, and gravel producers in the southern section of Ohio. Building permits were issued in large numbers, and winter construction was prosecuted to a larger extent than in past years. Although most of the sand and gravel pits in this section were not producing and current supplies were taken from stock piles, entailing additional charges of 25 cents per ton on deliveries, yet a noticeable amount of actual winter pit production by a few producing concerns of year round operation was in effect, and enjoyed by the consuming trade.

The outlook in the latter part of March seems certain to foretell of a favorable April and the coming season. Prices continue firm in all basic materials, in cement, lime, and gypsum as well. It has been stated that the well supplied market alone, has prevented additional price raises. No specific changes are in effect, although it is predicted among the trade that if spring demands increase as in the past an upward trend in prices may be expected, and at no distant date either. The increased quotations of last month continue as the present market prices. Washed gravel at $1.50 a ton, f. o. b. cars, sand at $1.20 per ton, f. o. b. cars, and crushed boulders at $1.65 a ton, are current values. Including the barrel, cement sells for $2.99 a barrel, and lime is quoted at $15.80 per ton, with mason's lime a little lower, selling at $13.30 f. o. b. cars. A few sand and gravel producers are selling at a variance from the sand and gravel supply house prices. One prominent pit operator quotes good sand from tipples at 10 cents lower than the supply houses, and wholesale quantities of washed gravel are sold at 15 cents less per ton than the prominent dealers' quotations. Around the first of April or shortly thereafter sand, washed gravel, and crushed boulders will be sold at prices which will not include the regular seasonal charge of 25 cents for drawing from stock piles.

All supply houses are handling a good volume of business, and they are contracting with building operations for the complete life of the job in all basic material except cement. On account of the mill distribution and smaller supples of cement no long period bookngs are justiified.

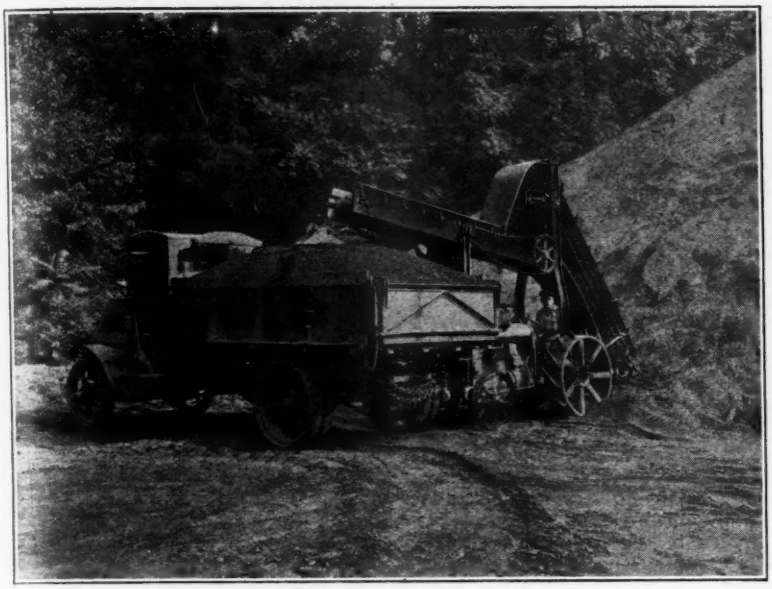
The latter part of March witnessed the letting of a number of small road repair and building contracts by the County commissioners of Hamilton County. These were the first appropriations in a number of months for road work in this section of southern Ohio.

Attesting to the fact that a few local pits are and have been doing winter work is the case of the Red Bank Gravel Company, whose operations include three plants of 1,000 tons per day capacity. F. W. Cornell, owner, announces that he is working his diggings to the tune of 60 per cent production, increasing this each week. Mr. Cornell is experimenting with a new idea of building concrete tunnel chutes under the tipples so that when the tipples are full, the overflow may be put on the ground for storage and handled with advantage. Mr. Cornell expresses optimism in the future road building work. He was one of the first in this locality to prove the expediency of building concrete roads in place of the macadam process, and is now supplying a number of road contractors with materials.

Mr. L. G. Wilde, of the Cincinnati Builders' Supply Co., has done a good volume of business the past month and anticipates even greater future markets, with the possibilities of resulting higher prices. The company is well supplied with materials but is experiencing renewed railroad car shortage troubles. The Cincinnati Builders Supply Company is booking quite a number of long time contracts.

Mr. J. E. McCracken, of the J. E. McCracken Supply Co. is getting top prices in face of an unusual good demand for materials. Some difficulty has been encountered by the firm in securing cement shipments, and on account of the railroad situation none of this material is supplied from the Lehigh Valley district, but all cement is shipped from the Ohio mills who are working at high speed to supply the strong demand.

High water on the Ohio river has handicapped the production of the river operators the past month. The



T. J. Hall Company report a large volume of business the past month and a firm future market. Their subsidiary, the Ohio River Sand and Gravel Company, is preparing for spring building supplies. The local river output is an economical material serviceable for every use except concrete finish.

A large tooth measuring 10 inches long, 5½ inches high, and weighing approximately 15 pounds was found in the sand and gravel pit of Joseph N. Dugan this month. Geologists of the University of Cincinnati aver that it is the tooth of a mammoth of the glacial period, and have had the tooth shellacked and turned over to the Geology Department of the University.

Two companies in Ashland, Ky., received papers of incorporation the past month. The Ashland Limestone Company was incorporated for $100,000 by R. P. Hill, Jr., M. E. Posey, and W. S. Hoge, Jr. The Ashland Sand and Gravel Company was incorporated for $100,000 by G. A. Northcutt, Huntington, W. Va., and W. P. Wheeler of Ashland.

The Ladwig Sand and Gravel Co., Milwaukee, Wisconsin, has been incorporated with a capital of $25,000. Otto Ladwig, Otto Ladwig, Jr., and Walter Ladwig.

Fordson Loader

A loader which uses a Fordson tractor as its propelling and operating power is being sold by the Specialty Engineering Company, Allegheny and Trenton Aves., Philadelphia, Pa.

In addition to a chain and bucket elevator, this loader has a conveyor boom for the more convenient loading of wagons and trucks, as shown in the illustration.

The installation is a comparatively simple operation, which can be performed in a few hours' time at any reasonably equipped Fordson service station. The rear supporting members terminate in cast steel saddles, which are strapped around the rear axles in the grooves already provided. This makes an integral part of the tractor. The equipment is driven from the power take-off shaft of the Fordson, a spocket wheel being furnished to replace the customary drive pulley. A clutch is also provided on the countershaft so that the loading equipment may be stopped or started in conjunction with the tractor clutch. A pair of jack screws are provided at the lower end of the elevator, so as to give road clearance when the equipment is moved.

Quarrying by Mining

Virginia Operator Now Using This Method With Good Results

There is possibly nowhere a more interesting rock-quarrying operation than that of the Princess Iron Corporation at Craigsville, Augusta County, Virginia. This quarry was secured by the corporation in 1915 for the purpose of supplying its Glen Wilton, Virginia, blast furnaces with high-grade calcite flux. For several years it was operated as an open-pit quarry, but in 1919, when the face became worked up to a height at which the overburden of earth and a seam of shaly limestone would have required very extensive stripping, the management decided to mine the stone underground by means of a series of tunnels driven in the face of the quarry, thereby escaping the expense of heavy stripping.

The quarry face at this time had reached the height of ninety feet and was still getting higher.

Tunnels were driven at distances of from 75 to 100 feet apart in the face of the quarry, which forms a crescent about 600 feet around. These tunnels or underground quarries were driven by keeping headings shot forward at the top and working down in benches. The tunnels are from 30 to 50 feet high, and from 20 to 36 feet wide at the entrance, gradually widening out and becoming higher inside. Some of them now extend a distance of 300 feet and several are 80 feet high and 100 or more feet wide. As work progresses some of these tunnels will be merged, thereby making a large underground quarry. Pillars are left standing at certain distances to support the overburden, a practice similar to that followed in coal mining. Thus, underground amid surroundings not unlike those found in many mines of the anthracite region, the quarrymen-miners and their helpers are every day drilling and blasting and loading calcite instead of coal.

Quarrying or mining stone in this way would seem to be an expensive operation as compared with open-pit quarrying, but it has not proved so with the Princess Iron Corporation. As the need here is for a high-grade limestone flux, free from dirt, this method of quarrying assures an absolutely clean product without the necessity of washing or picking. Stripping is entirely eliminated. Bad weather has no effect on the workers underground, and no time is lost on that account.

This quarry has a daily capacity of 500 tons of furnace flux stone and 250 tons of crushed commercial stone.

Du Pont explosives and blasting supplies are used exclusively by the Princess Iron Corporation and have contributed not a little to the success in this interesting and unusual quarry operation.—Du Pont Magazine.

All Depends on Supply

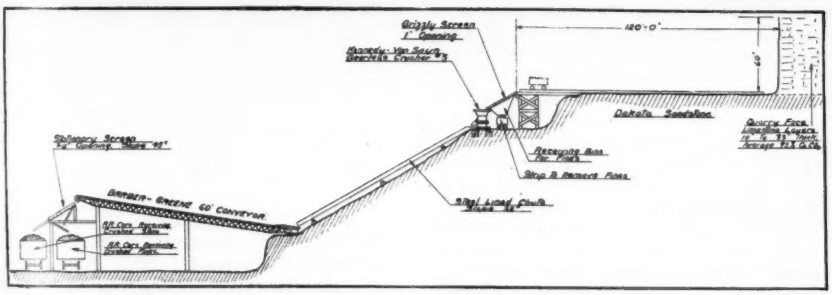
Material Market Will Be Limiting Factor in Construction

In the first 10 weeks of this year, says Allen E. Beals of the Dow Building Reports, New York, more orders for basic materials, appliances and equipments for this year's consumption have been placed, judging from the current volume of building operations as daily reported, against those reported for a similar period last year, by almost a third. If the present rate of placement of building material, appliance and equipment orders continues, manufacturing schedules for Eastern seaboard markets will have to be increased at least by 40 per cent. Some of these manufacturing schedules have already been increased.

Portland cement, the first to feel the pending pressure for building material supplies from a national point of view, has increased its 1923 manufacturing schedule from 123,000,000 barrels output to nearly 150,000,000. Seven new mills are being put in shape to meet the demand this year. Orders per day have been for some time almost double what they were at this time last year.

The dominating idea is that unless building materials can be produced in sufficient quantities to meet approximately the current demand, the demand itself will be automatically checked by any marked price advance to inability to meet the markets call.

If a sentence slogan should be called for to typify this year's building construction policy with a view to preserving the boom the most succinct would be "Keep the Market Steady." A general average price change upward will



certainly check demand. A general average price reduction, at this time would prolong, instead of stimulate, demand and some lines, sensing this most unusual building construction market trend, have led the way.

Cement was expected to advance earlier in the year. It is not likely to do so now. In fact, the tendency has been downward, rather than upward since last September. Taking cement as a fairly representative basic building material price fluctuations since June 23, 1920, follow based upon net prices exclusive of bag rebates:

June 23, 1920.....	$2.25	$2.35	$2.65
July 19, 1920.....	2.50	2.60	2.90
December 3, 1920.....	2.30	2.40	2.70
January 27, 1921.....	2.00	2.10	2.40
September 15, 1921....	1.75	1.85	2.10
November 22, 1921.....	1.60	1.80	2.00
May 17, 1922.....	1.80	1.90	2.10
August 4, 1922.....	2.00	2.10	2.30
September 2, 1922.....	2.25	2.35	2.55
October 17, 1922.....	2.00	2.10	2.30
February 27, 1923....	2.00	2.10	2.30

Conveyors Load from Crusher to Car

The above illustrations show the method employed to load cars in the plant of the Orman Crushed Rock Company, near Pueblo, Colo.

Here a Barber-Greene conveyor is used as a stationary piece of equipment.

It discharges onto a screen, separates the stone and the fines, discharging into different cars.

Mr. Reed, superintendent, reports that the conveyor handles an average of 250 cubic yards a day from crusher to cars, and that the conveyor is not being worked to capacity.

Yadkin Gravel Company of Lilesville, N. C., has been incorporated with a capital of $50,000. Adlai Osborne, O. H. Roberts and T. T. Patterson, Charlotte, Incorporators.

Prepare for Big Output

Pittsburgh Operators Getting Equipment Ready for That Purpose

By Our Pittsburgh Correspondent

With operations gradually curtailed during the final weeks of the winter period, the spring season among the sand and gravel producers at Pittsburgh, Pa., is destined for heavy activities. The different companies are making ready for large production, putting the dredgers and tugs in shape for this purpose. The demand for the output continues unabated, and orders are piling up for deliveries at the earliest possible date.

Prices show little, if any change, and there is marked stability and firmness in quotations. Washed gravel in wholesale quantities holds at $1.60 a cubic yard, f.o.b. float, while delivered on the water front, the material is priced at $2.00. Gravel delivered on the job varies from $2,25 a cubic yard upwards, according to length of haul. Sand is in good demand at substantially the same levels as gravel; first grade material is procurable at $1.50 f.o.b. float, and slight advance for delivery on the waterfront. Reserve stocks have gradually been depleted, and efforts are being made to replenish the supply. Crushed stone is selling at $2.85 a cubic yard, wholesale, in the local market, with dealers asking $4.50 for delivery on the job. Portland cement shows an advance from $2.14 to $2.24 a barrel at Pittsburgh, in carload lots, f.o.b. city, without bags. The material is operating under a heavy call. Dealers are quoting $3.25 a barrel for cement, delivered to destination.

The Central Sand & Gravel Co., Memphis, Tenn., has come to Pittsburgh for the construction of an all-steel barge, and a contract for the boat has been given to the Dravo Contracting Co. The work is now in progress. The barge will be 36 ft. wide, 175 ft. long and 8 ft. deep, and will have a capacity of 1,200 tons.

The Iron City Sand Co., Pittsburgh, has been active on the river with its towboat "Iron City" and sizeable quantities of sand and gravel have been hauled to the local port. The dredgeboat "Monarch," is producing in the Allegheny River, and following recent repairs is now in fine shape. The company's landing on the lower Allegheny River has been a busy point in connection with advance spring operations.

The Rodgers Sand Co. has been using its dredgeboats on the river, with steamers "Sweetcake" and "Twilight" active in hauling barges of sand and gravel to Pittsburgh and other nearby points, including Clairton, where heavy disposition has been under way. The towboat "Margaret" of this company's fleet will also be engaged under extensive distribution during the spring. The company has been making necessary boiler and equipment repairs, and tows are now in excellent shape.

Versatility of Operation

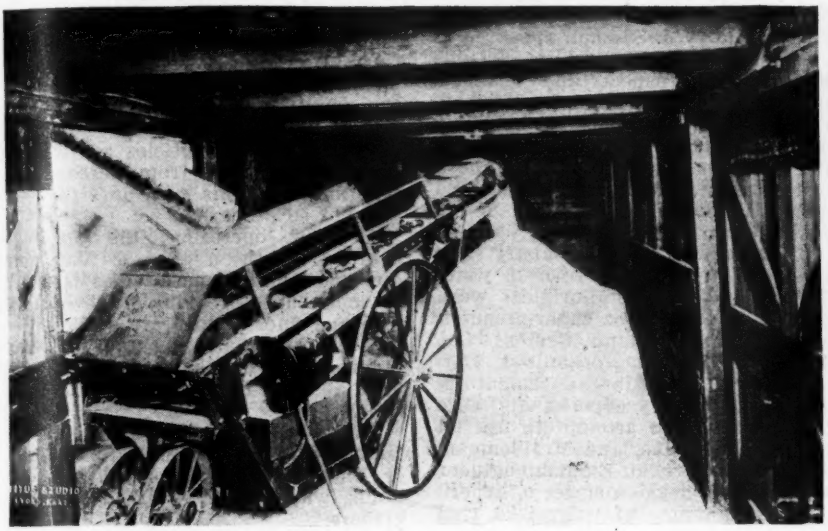
The Bay City Dredge Works, Bay City, Mich., has just issued a bulletin on its Model 16 crane excavator.

This bulletin shows this piece of equipment to have unusual versatility, being adaptable either to a skimmer scoop for stripping, a dragline operation, a clam shell operation, or with a regular shovel dipper.

The circular tells the whole story.

The Uehling Instrument Company, Paterson, N. J., has just appointed two new agents, namely John E. Arnold, 15½ South 4th Street, Tulsa, whose territory is the State of Oklahoma, and H. R. N. Johnson, 917-A Marquette Ave., Minneapolis, whose territory is Minnesota, North Dakota, and South Dakota. Both of these agents are well acquainted in the power plant field, and are thoroughly conversant with the problems necessitating the use of Uehling Co, recorders and other Uehling gauges. The Uehling Chicago Agent, Walter C. Lane, 20 West Jackson Blvd., recently returned to the Chicago territory after two months spent at the Paterson Plant assisting in the development of the new Uehling Co., or combustible, recorder.

Extensive improvements are being made at the plant of the Hudson River Trap Rock Company at Marlborough, N. Y., which is expected to open about April 1st. An expenditure of over $200,000 has been made for new machinery and equipment, which includes six crushers, two steam shovels, four gasoline locomotives and 25 cars.



Box Car Loader in Operation

Box Car Loader

A box car loader which will operate inside of box cars, is manufactured by Barber-Greene Company, Aurora, Ill.

In less than a minute this loader can be reduced to a minimum length of 8 feet, in which form it will easily turn around inside the box car.

When extended, the discharge end of the load is high enough to enable the machine to throw the material well up against the end of the car.

The belt speed is somewhat higher than that of the ordinary conveyor, which gives it good throwing capacity. The belt is fitted with cleats so that it can be operated on a high angle.

Recent Patents

The following patents of interest to readers of this journal recently were issued from the United States Patent Office. Copies thereof may be obtained from R. E. Burnham, patent and trade-mark attorney, Continental Trust Building, Washington, D. C., at the rate of 20c each. State number of patent and name of inventor when ordering.

1,446,389. Excavating-bucket. Henry C. D. McGrew, Los Angeles, Cal.

1,446,753. Crusher. Joseph E. Kennedy and Charles L. Carman, New York, N. Y.; said Carman assignor to said Kennedy.

1,447,332. Power-shovel. Edwin J. Armstrong, Erie, Pa., assignor to Ball Engine Co., same place.

1,447,355. Screening machine and method. Herand K. Najarian, Salt Lake City, Utah.

1,447,970. Washing and screening apparatus (for gravel). Raymond W. Dull, La Grange, Ill.

1,448,013. Crushing and grinding machine. James A. Warren, Denver, Colo.

1,448,103. Mine-car. Samuel A. Worcester, James L. Bruce, and Leroy S. Farnham, Butte, Mont.

1,448,212. Excavator. Leslie P. Green, Chicago, Ill.

1,448,310. Apparatus for grading and washing heavy material. Eugene D. Merwin, Seattle, Wash.

1,448,537. Mechanical shovel. Samuel Hoar, Virginia, Minn.

1,448,596. Sand-cleaner. John Kovach, East Chicago, Ind.

1,448,628. Feeder for ball-mills. Oscar H. Johnson, Denver, Colo., and Henry F. Webb, Salt Lake City, Utah, assignors to Mine & Smelter Supply Co., Denver, Colo.

1,448,668. Coal-jig. Moro P. Lewellen and Harry S. Arnold, Camden, N. J.

1,448,680. Drag-line excavator. Alexis P. Steele, Statesville, N. C.

A Pioneer Passes

When the announcement of the death of Harry J. Seaman appeared in the daily press, a host of friends paused in retrospect and realized, many with surprise, that a great leader and pioneer had died. An unfailing courtesy which had endeared him to his colleagues and subordinates, and a most retiring modesty, had militated against a popular appreciation of his excellent work.

He was graduated in chemistry from Lafayette in 1879, and with 13 years of experience in metallurigical work he came in 1892 to be superintendent of the Atlas Portland Cement Co., which was then being organized. During his first years in the cement industry many costly experiments were being made in an attempt to use oil for firing the kilns, and Mr. Seaman, with an associate, an English engineer named Hurry, began a series of experiments on the use of pulverized coal in cement burning. There was something approaching the dramatic in the application of these experimental runs to plant work. A large plant was constructed, using pulverized coal as a fuel, but the plant was also equipped with oil-burning appliances as a precautionary measure and to some extent to throw competitors off the trail. The operation of this plant was carried on for 2 years before many of the competitors realized the secret of its success.

During the 22 years in which Mr. Seaman was at the helm of the Atlas, the company grew from a small industrial plant of seven kilns to the huge organization operating 103 kilns with a combined output of 50,000 bbl. a day. This in 1914 made it the largest cement plant in the world. A severe illness then robbed Mr. Seaman of his energy and for 2 years he had virtually retired from active work. But during the war he was instrumental in the installation of potash-recovery systems to remove the potash from the cement kiln dust and he combined this process with waste-heat boiler installation and a complete elimination of flue dust from the kilns.—Chemical and Metallurgical Engineering.

The McAnge Lime Corporation, has been organized at Suffolk, Va., with a maximum capital of $25,000. W. N. McAnge, president; H. McR. Pinner, secretary and Peter Smith, all of Suffolk.

A Correction

Our attention has been called to the fact that an article in our February issue describing the plant of the Krippendorf-Tuttle White Cliffs Products Company, at White Cliffs, Ark., was inaccurate in some details.

Nearly all such articles are written by our own staff, from personal inspection; but this one unfortunately was not so prepared.

As now operating, the plant is equipped with a No. 6 Mammoth crusher handling material as large as 36 inch cube, breaking it down to 1 inch and finer at the rate of 75 to 100 tons per hour; also a No. 4 Jumbo to reduce the 1 inch material to ⅛ and finer at the rate of 40 to 50 tons per hour.

These were installed by the manufacturers, the Williams Patent Crusher and Pulverizer Company of St. Louis, who also acted as advisory engineers.

Safety Engineers to Meet

A mid-year safety conference has been called by the Engineering Section of the National Safety Council at Chicago, Ill., April 17, in the auditorium of the Western Society of Engineers, 53 W. Jackson Blvd. Handling material, dust and fume hazards, and traffic safety are the three main topics on the program.

The morning session will deal with causes of accidents in handling materials, and use of conveyors and trucks in eliminating material handling accidents, followed by a general discussion of specific safety problems in material handling. George T. Fonda, of the Fonda-Tolsted, Inc., Washington, D. C., chairman of the Engineering Section of the Council, will preside at the morning meeting.

Preventing dust fires and explosions, health protection against dust, and a discussion of practical methods of dust and fume removal will follow in the afternoon. Homer E. Niesz, Commonwealth Edison Company, Chicago, and treasurer of the National Safety Council, will preside at the banquet in the evening at which traffic problems will be discussed.

The Bridgeport Sand and Gravel Company, Bridgeport, Conn., has been incorporated with a capital of $20,000.

In Midst of Activity

Kentucky Producers Tuning Up For Big Spring Business

By Our Louisville Correspondent

There is a very lively air all around among both the stone people and the sand and gravel folks in the Louisville territory these days. The crushed stone people have been overhauling and tuning up their equipment lately and at this writing they are figuratively rolling up their sleeves and spitting on their hands to make things hum during the spring season, especially where highway contracts are involved. This highway work too, is expected to be a big feature of quarry and crushing operations in Kentucky this year.

The sand and gravel people have already gotten into the midst of spring activity and have been busy as bees all through the month of March. The winter demand was of such unusual volume that practically all of them had to get out and take chances on cold weather and ice and get on the job with their river work earlier this spring than usual.

The E. T. Slider Co., finding itself running short of gravel at the local yards here, got busy with that big jumbo digger in the river the latter part of February and have been very busy ever since, not only in the river work but also in local deliveries. They have had a surplus of sand right along but have had some shortage of gravel all winter and this started the digger crews to work a little earlier than usual in the present season.

G. E. Lloyd, manager of the Louisville yard of the E. T. Slider Co., says that the local trade in sand and gravel has been fine and that while it is early yet for car lot business out in the state this is showing signs of activity now too and all told it looks like we are to have a big spring season.

The Ohio River Sand Co. say that they started their river operations the first of March. This is a little earlier than usual but they had to get out because of reducing stocks on the yard to supply the winter and early spring demand. They report a splendid volume of winter and early spring business, that has kept them hustling right along and they look hopefully for a good carlot business too. Indeed this concern has enough faith in the situation that it has been busy lately equipping a new elevator plant which will be ready for operation the first of April. Meantime they are busy all around and it looks like a record-breaking spring season.

R. B. Tyler is at this writing down in Florida on a vacation trip. William N. Bosler, engineer for the R. B. Tyler Company, when asked for news of what it is doing among their crushing plants and road contracts, said that they have not been doing much crushing the past month but have confined their efforts to some grading and preliminary work and meantime have been overhauling their crusher equipment and getting ready to go. It looks to them like a busy season and they figure on going to it the latter part of March and keeping busy all spring and summer. There is plenty of work in sight; so much work, in fact, of all kinds that there is some scarcity of labor and the indications are that those with crusher plants and road contracts will have to pay higher for help this year and will therefore need to revise their figures upward on labor cost of operations. This is the outlook at least for the spring months. What may happen later will depend considerably on whether or not building operations continue at their present lively rate.

Though seemingly an unrelated matter there is really a good item of news for the trade here in the fact that the western Kentucky coal operators and miners signed a wage scale agreement in Louisville March 15th to continue effective a year from April first. This is not only good news from the viewpoint of it insuring continued operations of coal mines and therefore an available supply of coal, but it is good too in that no wage advances were involved. The old scale was agreed to unanimously, and while this seemed high a year ago, it is a different matter today in the face of the insistent demands for higher wages on the part of many in the building trades who were already getting a wage rate comparable with that of the coal miners.

The Carrico Stone & Lumber Co., the Rockford Sand & Gravel Co., and Hart & Page have consolidated to form the Northern Illinois Supply Company of Rockford, Illinois. The company is capitalized at $600,000.

Heil Distributors

The Chicago offices of the Heil Company have been moved from their former location 2718 Wentworth Ave., to their new place 2422-26 Cottage Grove Ave. The new service and sales room of the Chicago Heil distributors has three times more floor space than the old offices.

Twenty men are employed at this Chicago service station to mount the Heil hoist, Heil body and the Heil Quality tank equipment.

According to H. F. Kneppreth, manager of the Chicago branch, the Heil line of truck equipment is enjoying a brisk business in Chicago. He says there is a very great demand in Chicago for the Hydro hoist. Mr. Kneppreth is assisted by Joseph Wais.

The Heil Company of Milwaukee has established daily truck service from Milwaukee to Chicago. This service enables customers to get immediate delivery on their orders.

The home office of the Heil Company has also announced a change of address in the New York distributing station. The Motive Parts Corp., Heil distributors in New York territory, have moved from 136 West 55th St., to their new offices, 796 10th Ave., near 53rd St.

The H. P. Wilson Co., of Denver, Colo., has recently been engaged as the Heil distributor in that district. The office of the Wilson Co., is at 17th and Blake St. They are able to give complete service on all Heil equipment.

All About Explosives

We are in receipt of the first issue of a delightful new magazine—the "Explosives Engineer" published by the Hercules Powder Company, Wilmington, Del., and edited by Harry Roberts, Jr., and N. S. Greensfelder.

The new publication is delightfully gotten up in every detail and promises to be a very satisfactory presentation of the explosives industry from month to month, both in pictures and text.

One interesting feature of the present number is a four-page section, principally of photographic reproductions, showing explosives investigations being carried on by the United States Government. Another section shows reproductions of oil paintings, made especially for this publication, showing incidents in the coal mining industry.

Changes in Westinghouse Branch Offices

Several changes in the branch offices of the Westinghouse Electric & Manufacturing Company have been announced by W. S. Rugg, general sales manager of that company.

Two of the changes concern the managerships of two offices, the Baltimore and Huntington, W. Va., branch offices. C. V. Woodward has been appointed manager of the former office and F. C. Reed has been made manager of the Huntington office. R. J. Ross has been appointed assistant manager of the transportation division of the Philadelphia office and W. F. James has been appointed manager of the industrial division of the Philadelphia office, succeeding R. F. Moon, who has resigned to accept the vice presidency of the Atlantic Elevator Company, of New York.

Announcement

The Charter Gas Engine Company of Sterling, Ill., announces the purchase of the entire Mietz oil engine business, heretofore carried on at 128-138 Mott Street, and 430 East 19th Street, New York, by the August Mietz Corporation and the Reliance Oil Engine Corporation. This effects a merger and consolidation, under one management, of two of the oldest and best known internal combustion engines in the world.

The Charter Gas Engine Company is now moving from New York City to its plant at Sterling, Ill., all of the physical assets comprising the Mietz engine and in the meantime is filling no repair orders from New York, so that there will be no interruption in repair service.

Belt Fasteners

A bulletin which tells in detail a great many things about belt fasteners is published for free distribution by the Bristol Company, Waterbury, Conn.

This company makes metal belt fasteners of several different styles, all illustrated in the bulletin, together with their method of application.

The Ashland Sand and Gravel Company, Boyd, Ky., has been organized with a capital of $100,000. G. A. Northcutt, Huntington, West Va., and W. P. Wheeler and C. McLester of Ashland.

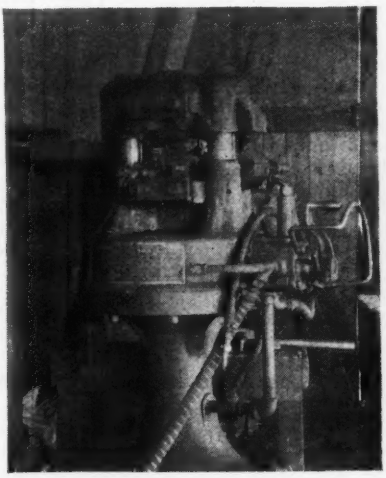
Convenient Drill Sharpening

At the quarry of the Virginian Limestone Corporation described elsewhere in this issue, has been developed a very good plan of conveniently handling drill sharpening problems. Before this plan was put into effect one of the big jobs around the quarry was that of running the steel between the drills and the machine shops and back again. Too many men were employed at this, and the one item of carrying the steel added too much to the drilling cost, resulted in too much confusion and hampered the operating of the drills, and in addition to this, imposed too great a burden on the shops.

Mr. Bobbitt, superintendent of the Virginian Limestone Corporation, figured a way out of this difficulty. He took an old Vulcan shovel for which the company had no use, stripped it of machinery, patched up the body and mounted on it all the necessary drill sharpening equipment. This "traveling machine shop" is equipped with a forge, anvil, Ingersoll-Rand air-driven drill sharpener, and such tools and small appliances as are necessary to handle the work conveniently.

As the steam shovel's regular railroad trucks were left on this traveling shop, it can be hauled to any location that is most convenient at any particular time. Thus the distance from the point where the drilling is done and the point where the drills are sharpened is always the shortest possible distance and the steel is conveniently transported between the two places. There is one distinct advantage in the fact that the regular machine shop is relieved of all this work which is now handled in the shop that has facilities installed wholly with this idea in mind. The only connection between the traveling shop and the plant is an air line that is run out from the compressor.

Producers who have a problem similar to this one of the Virginian Limestone Corporation, may see in this solution, a solution of their own difficulties.



Ingersoll-Rand Drill Sharpener on "Traveling Machine Shop"

The Walter A. Zelnicker Supply Company of St. Louis, Mo., have moved their offices from 325 Locust St., where they have been located for the last twenty years, to the Chamber of Commerce Bldg., 511 Locust St. The main plant and yards of this company in E. St. Louis, now cover fourteen acres.

The Virginian Limestone Corporation's "Traveling Machine Shop"

S. and G. Activities

Association Working Out Program for Benefit of Producers

By Our Washington Correspondent

Activities planned for the National Sand and Gravel Association during the present year, although not yet completely worked out, include an energetic and wide-spread campaign for the use of suitable materials. In this campaign it is hoped, according to Secretary T. R. Barrows, to educate builders to the value of high-grade materials. If this campaign is successful it will eliminate the dishonest producer as well as the one who is incapable of delivering materials of a grade that should be used.

One of the prime duties, however, of the association's headquarters in this city will be to work constantly toward a reduction in car shortage. This shortage has developed since this time last year when there was a car surplus of 278,481. At this time there is a shortage of approximately 72,855 cars, which means that the industry is beginning to feel a lack of sufficient cars. In connection with the efforts of the association's headquarters to keep the industry supplied with cars, there is also being conducted among the members of the association a campaign to "ship now." With this campaign on and with the fight which the association's headquarters is making against a car shortage it is hoped by Secretary Barrows to be able to keep building materials moving during the Spring season.

At the same time headquarters here is developing for the benefit of the members a comprehensive, yet simply and easily applied, uniform cost accounting system. The work on this system is rapidly progressing, and it is believed by Mr. Barrows that when it is put into operation by the members it will prove one of the most valuable adjuncts to their business. Such a system is growing and is fast becoming an urgent need of every member.

In connection with the present shortage of cars, it is stated by Secretary Barrows that it is daily becoming evident that the industry must be alert during their entire shipping season in order to insure an equitable supply of cars. It is not believed now that the Interstate Commerce Commission will again issue priority orders, but whether or not this is done it will be necessary for the members of the association to be constantly insisting upon a share of the cars that are available.

The "ship now" campaign has the endorsement of the Bureau of Public Roads and of various state highway commissions. It has resulted, Secretary Barrows states, in a better movement of materials and it is the belief that if the membership stands solidly back of the movement that material will be prevented from piling up at the points of production. In connection with this movement it is urged that members of the association get into touch with their customers, either personally or by letter, and frankly lay before them the true situation as regards car supply. It is felt that if such a course is taken buyers will aid the producers in getting the material away from the plants.

Reports to the Bureau of the Census, just made public, give the value of leather belting; belting and hose, other than leather, and of asbestos products manufactured during the year 1921, for which the census was taken.

In the case of leather belting, it is reported that the manufacture of that product amounted to $15,727,000 in 1921, as compared with $40,481,000 in 1919 and $23,036,000 in 1914, a decrease of 61.1 per cent from 1919 to 1921, and of 51.7 per cent for the seven-year period, 1914 to 1921. In addition, tanners and establishments assigned to other industry classifications reported leather belting as a finished product to the value of $4,948,000 in 1919 and $738,000 in 1914; corresponding figures for 1921 are not available at this time. Statistics for establishments with products valued at less than $5,000 are not included in the figures for 1921.

The value of products of establishments engaged primarily in the manufacture of belting and hose where the material was chiefly cotton, linen, or canvas amounted to $6,390,000 in 1921, as compared with $19,176,000 in 1919 and $4,441,000 in 1914, a decrease of 66.7 per cent from 1919 to 1921, but an increase of 43.9 per cent for the seven-year period 1914 to 1921. Several important establishments in this industry in 1919 had changed the character of their operations in 1921 and were assigned to other classifications.

Mining Diatomaceous Earth

By E. D. GARDNER
Mining Engineer, U. S. Bureau of Mines

A large deposit of diatomaceous earth or kieselguhr is mined near Lompoc, California; it covers several square miles, and ranges up to 700 feet thick. The bed contains many folds, but was apparently laid down horizontally at the bottom of a fresh-water Miocene sea. Kieselguhr consists of the siliceous skeletons of diatoms, of which over 2,000 varieties have been identified at Lompoc. According to the technical director of the company, three varieties predominate.

The deposit is owned and worked by the Celite Products Co. H. S. Thacher of Los Angeles is general manager and E. B. Starr of Lompoc is plant manager. The company has a mill for treating a part of the product at Lompoc, which is about 4 miles from the quarries. At the present rate of production, the supply should last for several centuries.

The principal uses of the kieselguhr are: (1) sawed brick for refractory purposes; (2), compressed refractory brick, which in quality is between the sawed brick and ordinary fire brick; (3), ground product, used as filtering material at sugar mills; (4) lightweight filler in concrete, used instead of rock aggregate in some Government work; (5), insulation purposes; (6), automobile polish, silver polish, diluting talcum powder, etc., (7), nitroglycerin absorbent in some grades of dynamite.

The character of the material varies in different parts of the bed and only selected parts where the overburden is light, are quarried. Also, certain parts of the bed are used for specific purposes. After cleaning off the overburden, the diatomaceous earth is quarried by means of a channeling machine developed by the company. Cuts are made across the face 4 feet deep and 4 feet apart. The largest part of the production is used for insulating brick, which are sawed on the ground from the blocks cut by the channeling machines. The machine used for sawing the brick was also developed by the company. The material desired for grinding is quarried, after channeling, by pick and shovel and loaded by hand into horse-drawn wagons and then hauled to a drying yard. The brick are hauled to a drying yard in light tram cars. After sun-drying, the brick are hauled to the railroad, and the other product to the mill in motor trucks.

At the mill, the sun-dried diatomaceous earth is fed by hand into an impact pulverizer, which is moved along the bottom of the storage bin. The pulverized material is drawn through galvanized iron tubing by an exhaust fan to the main building where it is packed for shipment in bags. The unbroken single diatoms are desired for filtering and some other uses. The dust, consisting of the finer particles and broken diatoms, which does not settle in the bins of the main building, is drawn into a bag house where it is filtered out of the air. This material is used for polishes and other similar purposes. All crushing is done dry.

The Kieselguhr is nearly pure silica and has the capacity of absorbing several times its weight of liquids. Dr. Herbert Insley, petrologist, U. S. Bureau of Mines, examined some of the samples under the microscope and made the following report:

"This material is very light in weight, due in part to its great porosity. Under the microscope, the material was found to be made up almost wholly of the skeletons of diatoms. These are composed of practically pure silica. The silica is evidently amorphous for there is no evidence of double refraction between crossed nicols. Most of the skeletons were unbroken. Complete skeletons more than three-tenths of a millimeter in greatest dimension were not observed, although some of the skeletons of which fragments were observed must have been at least seven-tenths of a millimeter in length. Disk-like diatoms containing hexagonal perforations or depressions and long, slender spine-like diatoms are very common."

Photomicrographs made by Dr. Insley show considerable fine dust and many sharp-edged particles.

The deposit is damp when first exposed, but during the summer months, the air is very dry and the wind blows almost continuously, hence the surface is soon dried.

Idle Plants to Operate

Rockcastle Company's Property at Pine Hill, Ky., to be Developed for Cement and Clay Products

After lying idle for about eight years, the property known as Pine Hill, at Pine Hill station, Rockcastle County, Kentucky, is about to be developed as a lime, cement and clay products proposition. To those who know this property it has been a matter of surprise that possessing as it does such obvious advantages and owned by such financially strong people, it should have been allowed to remain undeveloped as long as it has. It is a very large property of about 2,000 acres, and it contains practically inexhaustable deposits of limestone, shale, fire clay, and either actually on the property or geographically controlled by it are several million tons of fine semi-cannel coal. There is water on the place for extensive manufacturing operations and large tracts of timber.

It now transpires, however, that the owners of Pine Hill have not been neglecting or overlooking their property. Further investigations of all raw materials have been carried on both in the laboratory and by having produced in practical form from these raw materials lime, cement, hollow building tile, sewer pipe and face brick. These it appears have all been submitted to experts in the different lines, but more practical yet to architects, contractors, building materials men and users generally of their anticipated products. Exhaustive surveys have been made of the markets for their materials, and when they were satisfied that all the fundamentals of their proposition were sound and that the business recovery in the different lines in which they are interested warranted the large investment required work was commenced to put their plans in effect.

The first step was to recondition the lime plant, which was built on their property in 1912. This work was commenced on Jan. 1, 1922. All obsolete machinery was torn out and the plant was brought up to date in every particular. In anticipation of the heavy traffic it would have to carry, their short railroad from the L. & N. main line into their property was constructed to carry the heaviest locomotives of that road. Ninety-five pound rails, close ties and the best of grading were used. Their lime plant has now been running for about six months, and is expected will be selling to capacity this spring. Plans are now being perfected to add five additional 16 ton kilns to the lime plant, which with the existing five kilns will balance the hydrating capacity. Plans too are being matured for a Portland cement plant with a capacity of one million barrels per annum, and also a clay products plant to manufacture hollow building tile, sewer pipe and face brick with the capacity of about 150 tons per day.

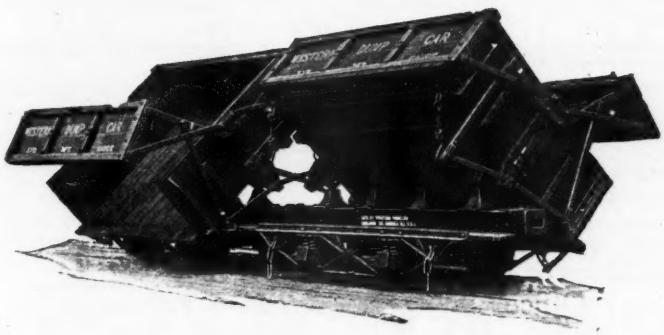
Richard K. Meade of Baltimore, Md., is the consulting engineer of the company, and is in general charge of the engineering and construction work.

This company will inaugurate a new departure in sales development. Immediately construction work commences on the cement and clay products units, sales offices will be opened in Cincinnati, Louisville and Knoxville and with samples on display of its actual products in each office. An immense amount of work has already been done in the matter of getting freight rates established from Pine Hill to points in the broad field they expect to cover, so that with the opening of the sales offices intelligent business relations can be established with the buyers in all of their territory. Spot deliveries can of course be made on lime up to their present capacity, which it is anticipated will be much more than doubled in the current year. With these plans all in effect, the company believes that with its low cost of production, and favorable freight rates to Louisville, Cincinnati and Knoxville; by making gateways of these points, it will get its full share of the business done.

Cement will be the leader as it is the largest unit and negotiations are practically concluded with one of the most successful operating men in the country to take care of the cement plant. The same may be said of its sales manager, and other plant managers. No experiments will be tried by the company in either men, materials or equipment.

The Rockcastle Cement & Lime Company is practically owned by a strong group of bankers and capitalists in Baltimore, so the usual financial difficulties may not be anticipated.

Maximum Production
Low Cost of Maintenance



These are the two distinguishing qualities of Western Dump Cars. They OUTWORK and OUTLAST other dump cars.

Said a plant superintendent in Ohio: "We have worked those Western cars continuously for eight months without repairs, and they are as good as new today. That is a good record for any machine."

Your haulage system is the key to quantity production. It is not economy to handicap a good shovel and crushing plant by using antiquated dump cars. Western Dump Cars, compared with others, will pay for themselves.

Western

That's Why

Our catalog No. A-53 shows photographic views of many pit and quarry installations. Send for it.

Western Wheeled Scraper Company

Earth and Stone Handling Machinery

AURORA, ILLINOIS

Iowa Stone Producers Form Association

Stone producers of Iowa at a recent meeting organized the Iowa Stone Producers' Association.

Paul L. Nauman, vice-president of the Eagle Point Lime Works, was elected president; Stanley M. Hand, vice-president and R. N. Winkle, secretary-treasurer.

The association has two classes of membership, active and associate. The former is for quarry operators only, while the latter is open to material and supply companies that furnish material for use in quarries.

Headquarters of the organization is in Cedar Rapids.

Bakstad Goes to Philadelphia Office

Mr. John Bakstad, who up to this time has been manager of the Chicago office of the Good Roads Machinery Company, has just left that office to take up more important duties at the company's home office at Kennett Square, Philadelphia, Pa.

Mr. M. A. King, who up to this time has been Mr. Bakstad's assistant at Chicago, will succeed him as manager of the Chicago office.

Both Mr. Bakstad and Mr. King are well known to crushed stone and gravel men of the Middle West. Their management of the Chicago office has been very successful and both are looking forward to further successes in their new positions.

Evinrude Pump Improvement

The Evinrude Motor Company, Milwaukee, announces a recent improvement in the bearing equipment of its centrifugal pump.

To support the pump shaft at the lower end, a ball thrust bearing has been provided. This bearing supplants the lignum vitae plug heretofore used. After a six months' test it has been found that the ball bearing greatly increases the life of the lower bearings and also makes the pump operate more freely and effectively.

This improvement is of special value because it can be installed in those pumps now in the hands of users.

New Capstan Car Puller

The Stephens-Adamson Manufacturing Company of Aurora, Ill., announces a new Monitor car puller of the vertical capstan type, self-contained and fully enclosed, which will pull from 3 to 5 loaded cars on a level track.

The new car puller is extreme in its simplicity and should prove popular with industrial concerns, who have cars to spot on side tracks. The power is furnished by a 7½ H. P. electric driving motor built into the device and entirely enclosed. The car puller requires little floor space and is only slightly over 4 feet in height.

The company asks that producers when writing for prices, state the number of loaded or empty cars to be handled, also that they give the characteristics of the electric current available.

Clifford F. Messinger, for the past three years general sales manager of the Chain Belt Company, Milwaukee, has been elected second vice president, according to an announcement just made by the company.

The Bodega Materials Company, Murphysboro, Ill., has been recently incorporated with a capital of $200,000. Incorporators: James C. Emery, R. E. Henfrom, Thomas Aldridge. Correspondent: F. O. Glenn, Springfield, Ill.

Indiana interstate freight rates on agricultural limestone are expected to drop an average of about 25 per cent, as soon as the railroad companies can publish the new tariffs. An immense amount of this agricultural limestone is transported in Indiana each year.

A rock and gravel crushing plant, to cost in the neighborhood of $200,000, will soon be erected between Sacramento and Folsoma, Cal., by the Pratt Rock & Gravel Co., recently organized by Clarence F. Pratt, president of the Pratt Building Material Company of San Francisco.

The Northwestern Sand and Gravel Company of Des Moines, Iowa, has purchased the stone quarry and rock crushing plant at the Cozzi quarry at East Quarry, Iowa, at a cost of $100,000. The company intends to erect a huge reducing plant, and expect to have a crusher in operation by early summer.